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August 22, 2008

Jeff Inglis  
United States Environmental Protection Agency  
Region 9  
75 Hawthorne Street  
San Francisco, CA 94105

**Subject: Mesa I Mines, Preliminary Assessment Report**  
**EPA ID NO.: NND983466772**

Attached is the Preliminary Assessment Report for the Mesa I Mines site, prepared by Weston Solutions, Inc. Also included are the Transmittal List, Contact Log, Contact Reports, Latitude and Longitude Calculation Worksheet, References and the Environmental Protection Agency Quick Reference Fact Sheet. The HRS Scoresheets and Rationale are included in the separately bound confidential information packet, along with the EPA Region 9 GIS Report.

If you have any questions regarding this report, please do not hesitate to contact me at (925) 948-2658 or [Tara.Fitzgerald@westonsolutions.com](mailto:Tara.Fitzgerald@westonsolutions.com).

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Tara Fitzgerald", is written over a horizontal line.

Tara Fitzgerald  
Assistant Project Scientist

Attachments




## COMPONENTS FOR SITE ASSESSMENT REPORT PACKAGES

\*\*\*\*Applicable to PA, PA/SI, SI and ESI report packages\*\*\*\*  
(to be submitted to EPA by the contractor, state agency, or tribe)

Site Name: Mesa I Mines

EPA ID NO.: NND983466772

- ☒ 1. Cover Letter
- ☒ 2. Site Assessment Report (Including table of contents and list of appendices, tables, and figures)
- ☒ 3. Appendix A, Transmittal List
- ☒ 4. Appendix B, Site Reconnaissance Interview and Observation Report/Photographic Documentation
- ☒ 5. Appendix C, Contact Log and Contact Reports
- ☒ 6. Appendix D, Latitude and Longitude Calculations Worksheet
- ☒ 7. Appendix E, References
- ☒ 8. Appendix F, EPA Quick Reference Fact Sheet: (*Site Assessment: Evaluating Risks at Superfund Sites*)
- ☐ 9. Appendix G, Sampling and Analysis Plan
  - ☒ Not applicable to non-sampling sites
- ☐ 10. Appendix H, Analytical Results (From EPA-sponsored sampling event only)
  - ☒ Not applicable to non-sampling sites
- ☐ 11. Appendix I, EPA Region 9 Remedial Site Assessment Decision Form (To be completed by EPA)
- ☒ 12. Confidential Information Packet - separately bound (Including HRS Scoresheets, HRS Rationale, and GIS Report)

Approved by:   
Program Manager  
Weston Solutions, Inc.

Approved by: \_\_\_\_\_  
EPA Task Monitor  
United States Environmental Protection Agency, Region 9

**Preliminary Assessment Report  
Mesa I Mines  
Apache County, Arizona**

**EPA ID NO.: NND983466772  
Contract No: W91238-06-F-0083  
Project No: 12767.063.491**

**August 2008**

**Prepared for:  
United States Environmental Protection Agency  
Region 9**

**Prepared by:  
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Appendix F: EPA Quick Reference Fact Sheet: *(Site Assessment: Evaluating Risks at Superfund Sites)*

## **List of Acronyms**

|         |  |
|---------|--|
| AEC     | United States Atomic Energy Commission   |
| CERCLA  | Comprehensive Environmental Response, Compensation, and Liability Act of 1980        |
| CERCLIS | Comprehensive Environmental Response, Compensation, and Liability Information System |
| EPA     | United States Environmental Protection Agency  |
| HRS     | Hazard Ranking System  |
| MCL     | Federal Maximum Contaminant Level  |
| NAML RP | Navajo Abandoned Mine Lands Reclamation Program                                      |
| NPL     | National Priorities List   |
| NSP     | Navajo Nation Environmental Protection Agency – Superfund Program                    |
| PA      | Preliminary Assessment   |
| RCRIS   | Resource Conservation and Recovery Information System                                |
| SARA    | Superfund Amendments and Reauthorization Act of 1986                                 |
| WESTON  | Weston Solutions, Inc.   |

## **1.0 INTRODUCTION**

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), Weston Solutions, Inc. (WESTON) has been tasked to conduct a Preliminary Assessment (PA) of the Mesa I Mines site (Site) in Apache County, Arizona.

The purpose of the PA is to review existing information on the site and its environs to assess the threat(s), if any, posed to public health, welfare, or the environment and to determine if further investigation under CERCLA/SARA is warranted. The scope of the PA includes the review of information available from federal, state, tribal, and local agencies and performance of an onsite reconnaissance.

Using these sources of existing information, the site is evaluated using the United States Environmental Protection Agency's (EPA's) Hazard Ranking System (HRS) criteria to assess the relative threat associated with actual or potential releases of hazardous substances at the site. The HRS has been adopted by the EPA to help set priorities for further evaluation and eventual remedial action at hazardous waste sites. The HRS is the primary method of determining a site's eligibility for placement on the National Priorities List (NPL). The NPL identifies sites at which the EPA may conduct remedial response actions. This report summarizes the findings of these preliminary investigative activities.

The Site was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) on September 24, 1990 (NND983466772) (1).

More information about the Superfund program is available on the EPA web site at <http://www.epa.gov/superfund>. The attached fact sheet describes EPA's site assessment process (Appendix F).

### **1.1 Apparent Problem**

The apparent problems at the site, which contributed to the EPA's determination that a PA was necessary, are presented below:

- The Site was mined for uranium ore at several intervals from 1950 until 1967. Low grade uranium ore is present at the Site (2).
- There are two drinking water wells shut down within 4 miles of the Site due to radiological contamination (Appendix C-1, C-2).

## **2.0 SITE DESCRIPTION**

### **2.1 Site Location**

The Site is located approximately 2 miles south of Cove, Apache County, Arizona on Navajo Nation territory. The geographic coordinates for the site are 36° 31' 20" North latitude and 109° 12' 49" West longitude (Appendix D). The location of the site is shown in Figure 2-1 (2, 3).

### **2.2 Site Description**

The Site occupies approximately 68 acres located in the Lukachukai Mountains. The Site consists of 11 separate mine sites:

- ¼ mine
- ½ mine
- ½ west mine
- ¾, Incline
- ¾, Mine No. 2 P-150
- Mine 10
- Mine 11
- Mine 12
- Mine 13
- Mine 14
- Mine 15

The individual mine sites are located near the top of prominent ridges on a mesa, named Mesa I by the United States Atomic Energy Commission (AEC) in 1950, in the Lukachukai Mountains. The Site is no longer being actively mined. Figure 2-2 shows the site layout (2, 3, Appendix, B).

### **2.3 Operational History**

Uranium ore was mined at the Site intermittently from 1950 to 1967. The following businesses operated uranium mines during those years: F.A. Sutton, Inc. from 1950 to 1951, Navajo Uranium from 1951 to 1952, Kerr-McGee Oil Industries, Inc. from 1953 to 1958 and 1961 to 1963, and Vanadium Corporation of America from 1965 to 1967. During the years the Site was mined, mining activities were conducted year round. In 1967, Vanadium Corporation of America ceased mining operations and abandoned the Site (2).

WESTON conducted a visit to the Site on July 1, 2008 and July 2, 2008. WESTON visited individual mine sites that were identifiable during the site visit: Mine 11, Mine 12, and Mine 13. During the site visit, WESTON used a combination sodium-iodide

scintillation detector and a GPS unit to detect gamma radiation at the three individual mine sites: Mine 11, Mine 12, and Mine 13. A stand-alone scintillation detector was used as well. The background gamma radiation was 14,790 counts per minute. Gamma radiation was detected above background at all three mine sites. In some areas that were visited, particularly Mine 12, uranium ore outcroppings were exposed to the surface. Gamma radiation was detected at 999,960 counts per minute near the uranium ore outcropping at Mine 12. Gamma reading location and measurement maps are presented in Figure 2-3 (Appendix B).

## **2.4 Regulatory Involvement**

### ***2.4.1 United States Environmental Protection Agency***

The Site is not listed in the Resource Conservation and Recovery Information System (RCRIS) database as of July 30, 2008 (4).

### ***2.4.2 Navajo Nation Environmental Protection Agency – Superfund Program***

A PA report was completed by the Navajo Nation Environmental Protection Agency - Navajo Superfund Program (NSP) on April 12, 1991. On September 22, 1992, NSP completed a PA Reassessment report for the Site. The NSP noted in the PA Reassessment that the Site would be referred to the Navajo Nation Division of Natural Resources, Navajo Abandoned Mine Lands Reclamation Program (NAMLRP) (2, 3, 5).

### ***2.4.3 Navajo Nation Division of Natural Resources, Navajo Abandoned Mine Lands Reclamation Program***

The NAMLRP received funding from the United States Office of Surface Mining to reclaim part of the Site. The NAMLRP required that sites be reclaimed so that the residual gamma emission from the reclaimed surfaces did not exceed 50 micro roentgens per hour, approximately 50,000 counts per minute. In addition, the NAMLRP required that the residual Radium-226 concentration in the first 6 inches of reclaimed soil did not exceed 25 picocuries per gram in order to be considered reclaimed. Figure 2-2 shows the individual mine sites that were reclaimed or partially reclaimed by the NAMLRP. Figure 2-4 shows gamma radiation measurements that are below two times the background gamma radiation measurement, above two times the background gamma radiation measurement, and above the NAMLRP cleanup goal of 50,000 counts per minute. Table 2-1 provides summary information for individual mine sites, including the NAMLRP Identification and the tons of ore and uranium oxide mined. Reclamation activities conducted by the NAMLRP included backfilling adits, portals, highwalls, rimstrips, and pits at the individual mine sites with radioactive mine waste (low-grade uranium ore) left at the Site, diverting drainage from the backfilled areas, and closing open portals with polyurethane foam. The NAMLRP guidelines called for the creation of drain fields to receive water diverted from portals. Non-contaminated soil may also have been used as cap in some areas (2, 3, 6, Appendix B).

The NAMLRP partially reclaimed the individual mine sites:  $\frac{3}{4}$  Mine No. 2, P-150, Mine 10, Mine 11, Mine 12, Mine 13, Mine 14, and Mine 15. The individual mine sites are considered only partially reclaimed in part because some areas containing low-grade uranium ore were not physically accessible and thus were not reclaimed. WESTON identified an area containing low-grade uranium ore that was physically inaccessible at a mesa ridge at Mine 12 during a visit to the Site on July 2, 2008. During the July 2008 site visit, WESTON collected gamma radiation readings that were above 50,000 counts per minute in sections of Mine 11, Mine 12, and Mine 13 as shown in Figure 2-4. The gamma radiation readings collected at Mine 13 were taken on top of a soil cap that was installed by NAMLRP during the reclamation process. Sections of the reclaimed area at Mine 13 appeared to have eroded over time. According to documentation, the NAMLRP fully reclaimed the  $\frac{1}{2}$  West Mine and the  $\frac{3}{4}$  Incline mine sites. WESTON did not collect gamma radiation measurements at the  $\frac{1}{2}$  West Mine or the  $\frac{3}{4}$  Incline mine sites due to their inaccessibility at the time of the site visit (2, 3, 6, Appendix B).

### **3.0 HRS FACTORS**

#### **3.1 Sources of Contamination**

For HRS purposes, a source is defined as an area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance.

Potential hazardous substance sources associated with the Site include, but may not be limited to:

- Excavated onsite mine workings from previous uranium mining with elevated gamma radiation measurements (2, 3).

#### **3.2 Groundwater Pathway**

In determining a score for the groundwater migration pathway, the HRS evaluates: 1) the likelihood that sources at a site actually have released, or potentially could release, hazardous substances to groundwater; 2) the characteristics of the hazardous substances that are available for a release (i.e., toxicity, mobility, and quantity); and 3) the people (targets) who actually have been, or potentially could be, impacted by the release. For the targets component of the evaluation, the HRS focuses on the number of people who regularly obtain their drinking water from wells that are located within 4 miles of the site. The HRS emphasizes drinking water usage over other uses of groundwater (e.g., food crop irrigation and livestock watering), because, as a screening tool, it is designed to give the greatest weight to the most direct and extensively studied exposure routes.

### ***3.2.1 Hydrogeological Setting***

The Site lies in the Arizona Department of Water Resources Eastern Plateau Planning Area. The Eastern Plateau Planning Area is composed on one groundwater basin, the Little Colorado River Plateau Basin. There are several local aquifers and three regional aquifers that lie in the Eastern Plateau Planning Area. The aquifers consist of sedimentary formations of sandstone and limestone that are stacked on top of one another and generally separated by impermeable shales and siltstones. In descending order, the regional aquifers are the D-, N-, and C- aquifers. Each aquifer has a large areal extent within the basin and with the exception of the D- and N- aquifers; there is little vertical hydrologic connection between them. The water bearing formations gain thickness towards the center of the basin resulting in artesian conditions. Main recharge areas are along the southern and eastern periphery of the Eastern Plateau Planning Area. The Little Colorado River Plateau aquifers contain an estimated 508 million acre-feet of water (7).

Artesian conditions are known to exist at two wells, Cottonwood Springs and Hidden Springs, within 4 miles of the Site. The depth to groundwater at these wells is considered to be at the ground surface (2, 7, Appendix C-1, C-2).

### ***3.2.2 Groundwater Targets***

The United States Bureau of Indian Affairs operates two wells, Cottonwood Springs and Hidden Springs, located within 4 miles of the Site that serve approximately 100 people. The Hidden Springs well is currently offline due to lead and uranium contamination (2, 3, Appendix C-1)

Additionally, the Navajo Tribal Utility Authority operated groundwater well 12T-341 until 1985, when it was taken offline due to uranium metal and radiological contamination above the Maximum Contamination Level. Well 12T-666 was installed to replace well 12T-341. Well 12T-341 was left in place to serve as a backup well to well 12T-666, although currently it is not online and may have been abandoned. Well 12T-666, which serves the remaining 300 residents in Cove, is not located within 4 miles of the Site (2, 3, Appendix C-2).

### ***3.2.3 Groundwater Pathway Conclusions***

A developed artesian well, Hidden Springs, currently is offline due to radiological contamination. An additional well, 12T-341 was taken offline in 1985 due to uranium metal and radiological contamination. There are no background contaminant levels to determine whether contamination in these wells was caused by the Mesa I Mines site. Approximately 100 people are served by the Cottonwood Springs well, located within 4 miles of the Site. The remaining 300 residents in Cove are served by a well that is not located within 4 miles of the Site (3, Appendix C-1, C-2).

### **3.3 Surface Water Pathway**

In determining the score for the surface water pathway, the HRS evaluates: 1) the likelihood that sources at a site actually have released, or potentially could release, hazardous substances to surface water (e.g., streams, rivers, lakes, and oceans); 2) the characteristics of the hazardous substances that are available for a release (i.e., toxicity, persistence, bioaccumulation potential, and quantity); and 3) the people or sensitive environments (targets) who actually have been, or potentially could be, impacted by the release. For the targets component of the evaluation, the HRS focuses on drinking water intakes, fisheries, and sensitive environments associated with surface water bodies within 15 miles downstream of the site.

Surface water flow runs to drainages below the individual mines that make up the Mesa I Mines site. Surface water originating from the Mesa I Mines site would then flow to the north toward Cove. Surface water flow from the Mesa I Mines site is generated by precipitation only as there are no springs or streams running through the Mesa I Mines site. Average precipitation for the area is approximately 10 inches per year. Drainage routes continue to the northeast of the Mesa I Mines site for the remainder of the 15-mile target distance limit (2, 3, 7).

Debris, including low-grade uranium ore was pushed into drainages below the Mesa I Mines site during mining operations (2, Appendix B).

### **3.4 Soil Exposure and Air Pathways**

In determining the score for the soil exposure pathway, the HRS evaluates: 1) the likelihood that there is surficial contamination associated with the site (e.g., contaminated soil that is not covered by pavement or at least 2 feet of clean soil); 2) the characteristics of the hazardous substances in the surficial contamination (i.e., toxicity and quantity); and 3) the people or sensitive environments (targets) who actually have been, or potentially could be, exposed to the contamination. For the targets component of the evaluation, the HRS focuses on populations that are regularly and currently present on or within 200 feet of surficial contamination. The four populations that receive the most weight are residents, students, daycare attendees, and terrestrial sensitive environments.

In determining the score for the air migration pathway, the HRS evaluates: 1) the likelihood that sources at a site actually have released, or potentially could release, hazardous substances to ambient outdoor air; 2) the characteristics of the hazardous substances that are available for a release (i.e., toxicity, mobility, and quantity); and 3) the people or sensitive environments (targets) who actually have been, or potentially could be, impacted by the release. For the targets component of the evaluation, the HRS focuses on regularly occupied residences, schools, and workplaces within 4 miles of the site. Transient populations, such as customers and travelers passing through the area, are not counted.

The Site is unpaved with the exception of a small concrete pad located at Mine 12. There are no residences, schools, or daycare facilities on, or within 200 feet, of the Site. Most individual mine sites are accessible via dirt roads previously use for uranium mining operations. There are no terrestrial sensitive environments onsite (2, 8, Appendix B).

#### **4.0 EMERGENCY RESPONSE CONSIDERATIONS**

The National Contingency Plan [40 CFR 300.15 (b)(2)] authorizes the EPA to consider emergency response action at those sites which pose an imminent threat to human health or the environment. For the following reasons, a referral to EPA Region 9's Emergency Response Section does not appear to be necessary:

- The Site is currently abandoned. Mining operations at the Site ceased in 1967. The NAMLRP has conducted reclamation work throughout the Site. There are no residences, schools, or daycare facilities on, or within 200 feet of the Site (2, Appendix B).

#### **5.0 SUMMARY**

The Mesa I Mines site (Site) occupies approximately 68 acres located in the Lukachukai Mountains. The Site is located approximately 2 miles south of Cove, Apache County, Arizona on Navajo Nation territory. The geographic coordinates for the site are 36° 31' 20" North latitude and 109° 12' 49" West longitude. The Site consists of 11 separate mine sites: ¼ mine, ½ mine, ½ west mine, ¾, Incline, ¾, Mine No. 2 P-150, Mine 10, Mine 11, Mine 12, Mine 13, Mine 14, and Mine 15. The individual mine sites are located near the top of prominent ridges on a mesa, named Mesa I by the United States Atomic Energy Commission in 1950, in the Lukachukai Mountains.

Uranium ore was mined at the Site intermittently from 1950 to 1967. The following businesses operated uranium mines during those years: F.A. Sutton, Inc. from 1950 to 1951, Navajo Uranium from 1951 to 1952, Kerr-McGee Oil Industries, Inc. from 1953 to 1958 and 1961 to 1963, and Vanadium Corporation of America from 1965 to 1967. During the years the Site was mined, mining activities were conducted year round. In 1967, Vanadium Corporation of America ceased mining operations and abandoned the Site.

WESTON conducted a visit to the Site on July 1, 2008 and July 2, 2008. During the site visit, WESTON used a combination sodium-iodide scintillation detector and a GPS unit to detect gamma radiation at three of the individual mine sites: Mine 11, Mine 12, and Mine 13. A stand-alone scintillation detector was used as well. The background gamma radiation was 14,790 counts per minute. Gamma radiation was detected above background at all three mine sites. In some areas that were visited, particularly Mine 12, uranium ore outcroppings were exposed to the surface. Gamma radiation was detected at 999,960 counts per min near the uranium ore outcropping.



A PA report was completed by the Navajo Nation Environmental Protection Agency - Navajo Superfund Program (NSP) on April 12, 1991. On September 22, 1992, NSP completed a PA Reassessment report for the Site. The NSP noted in the PA Reassessment that the Site would be referred to the Navajo Nation Division of Natural Resources, Navajo Abandoned Mine Lands Reclamation Program (NAMLRP).

The NAMLRP received funding from the United States Office of Surface Mining to reclaim part of the Site. The NAMLRP required that sites be reclaimed so that the residual gamma emission from the reclaimed surfaces did not exceed 50 micro roentgens per hour, approximately 50,000 counts per minute. In addition, the NAMLRP required that the residual Radium-226 concentration in the first 6 inches of reclaimed soil did not exceed 25 picocuries per gram in order to be considered reclaimed. Reclamation activities conducted by the NAMLRP included backfilling adits, portals, highwalls, rimstrips, and pits at the individual mine sites with radioactive mine waste (low-grade uranium ore) left at the Site, diverting drainage from the backfilled areas, and closing open portals with polyurethane foam. The NAMLRP guidelines called for the creation of drain fields to receive water diverted from portals. Non-contaminated soil may also have been used as cap in some areas

The NAMLRP partially reclaimed the individual mine sites:  $\frac{3}{4}$  Mine No. 2, P-150, Mine 10, Mine 11, Mine 12, Mine 13, Mine 14, and Mine 15. The individual mine sites are considered only partially reclaimed in part because some areas containing low-grade uranium ore were not physically accessible and thus were not reclaimed. WESTON identified an area containing low-grade uranium ore that was physically inaccessible at a mesa ridge at Mine 12 during a visit to the Site on July 2, 2008. During the July 2008 site visit, WESTON collected gamma radiation readings that were above 50,000 counts per minute in sections of Mine 11, Mine 12, and Mine 13 as shown in Figure 2-4. The gamma radiation readings collected at Mine 13 were taken on top of a soil cap that was installed by NAMLRP during the reclamation process. Sections of the reclaimed area at Mine 13 appeared to have eroded over time. According to documentation, the NAMLRP fully reclaimed the  $\frac{1}{2}$  West Mine and the  $\frac{3}{4}$  Incline mine sites. WESTON did not collect gamma radiation measurements at the  $\frac{1}{2}$  West Mine or the  $\frac{3}{4}$  Incline mine sites due to their inaccessibility at the time of the site visit.

A developed artesian well, Hidden Springs, currently is offline due to radiological contamination. An additional well, 12T-341 was taken offline in 1985 due to uranium metal and radiological contamination. There are no background contaminant levels to determine whether contamination in these wells was caused by the Mesa I Mines site. Approximately 100 people are served by the Cottonwood Springs well, located within 4 miles of the Site. The remaining 300 residents in Cove are served by a well that is not located within 4 miles of the Site.

The following pertinent Hazard Ranking System factors are associated with the site:

- There is one active drinking water well within 4 miles of the Site located between 3 and 4 miles to the north. A total population of 100 is served by the well.
- Surface water flow runs to drainages below the individual mines that make up the Mesa I Mines site. Surface water originating from the Mesa I Mines site then flows to the north toward Cove. Surface water flow from the Mesa I Mines site is generated by precipitation only as there are no springs or streams running through the Mesa I Mines site. Average precipitation for the area is approximately 10 inches per year. Drainage routes continue to the northeast of the Mesa I Mines site for the remainder of the 15-mile target distance limit. Debris, including low-grade uranium ore was pushed into drainages below the Mesa I Mines site during mining operations
- The Site is currently abandoned. Mining operations at the Site ceased in 1967. There are no residences, schools, or daycare facilities on, or within 200 feet of the Site.

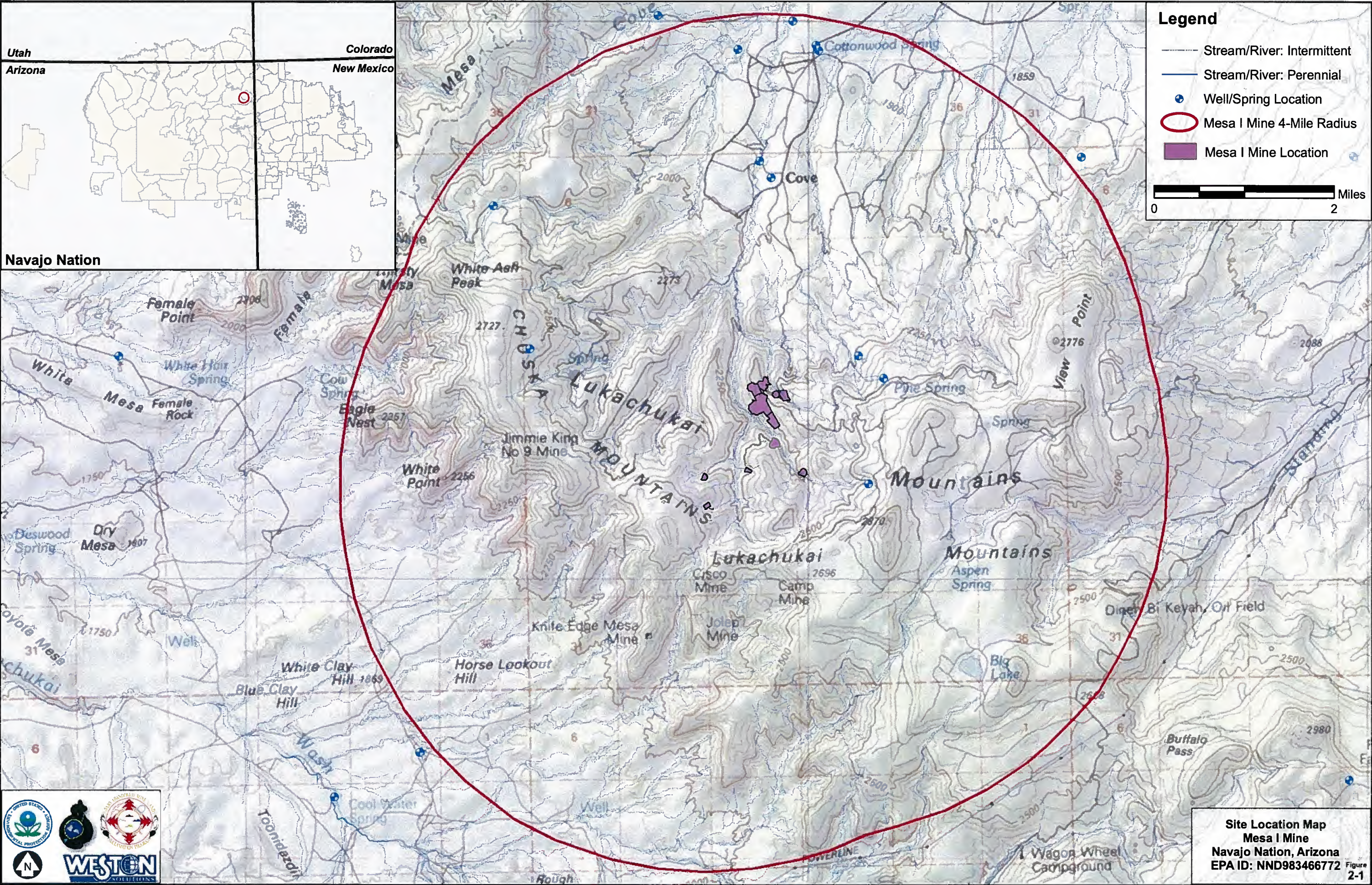
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3. TerraSpectra Geomatics, Abandoned Uranium Mines And The Navajo Nation - Navajo Nation AUM Screening Assessment Report And Atlas With Geospatial Data, August 2007.
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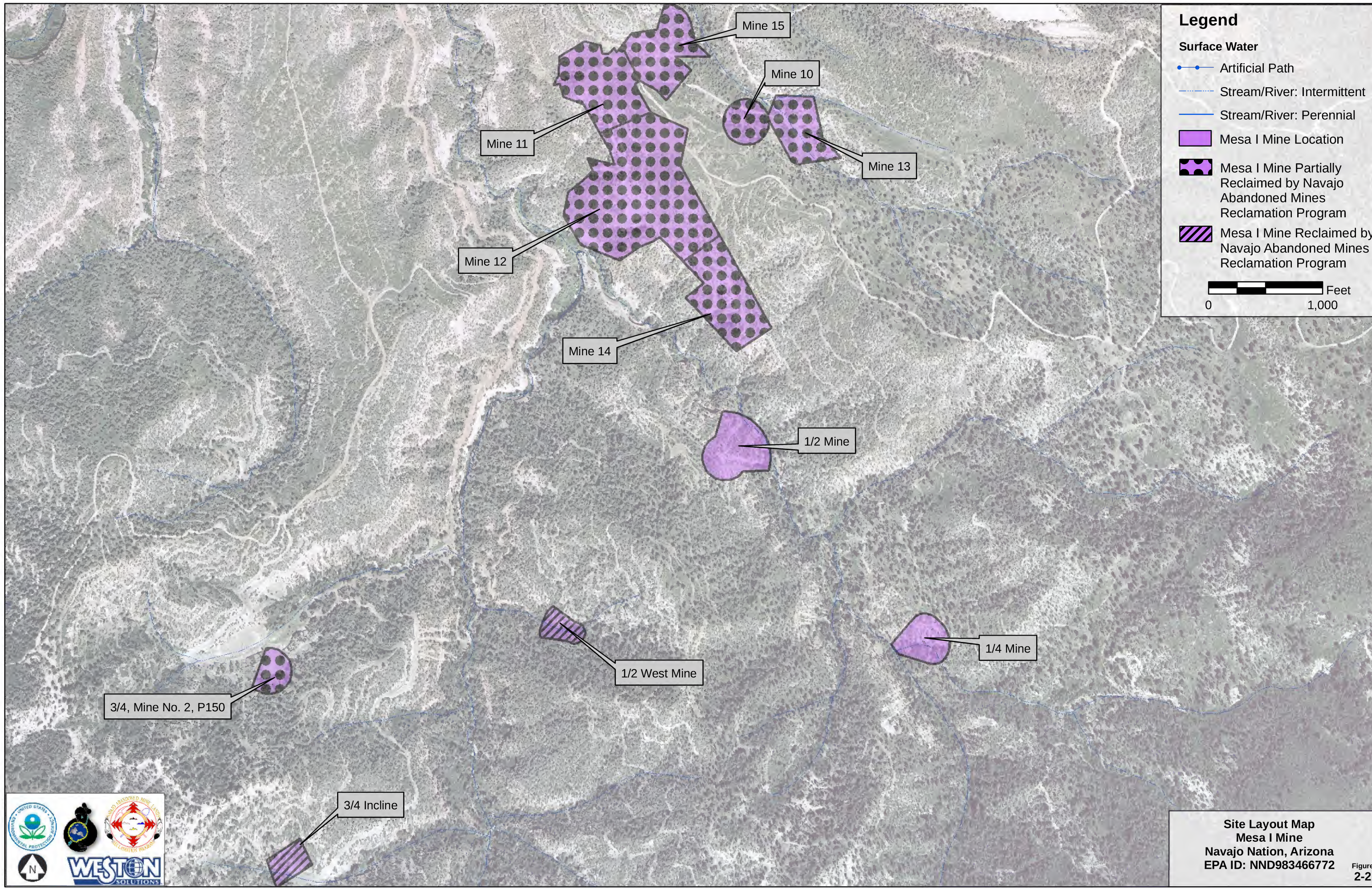
5. Hoskie, Sadie, The Navajo Nation, Navajo Superfund Program, Letter to Paul LaCourreys, EPA Region 9, September 22, 1992.
6. The Navajo Nation, Navajo Abandoned Mine Lands Reclamation Program, Cove 3 - Phase II AML Reclamation Project, Proposal Documents, May 2001.
7. Arizona Department of Water Resources, Arizona Water Atlas, Volume 2, Eastern Plateau Planning Area, DRAFT, June 2006.
8. Weston Solutions, Inc., Cove Mesa Site Visit Field Notes, July 2, 2008.

| Table 2-1: Mesa I Mines Site Summary Table |                              |                                       |                                      |                              |                |                   |                               |  |
|--|------------------------------|---------------------------------------|--------------------------------------|------------------------------|----------------|-------------------|-------------------------------|--|
| CERCLA MINE NAME                           | ALIASES                      | CERCLA ID                             | NAMLRP ID                            | SITE AREA<br>(Square Meters) | TONS OF<br>ORE | POUNDS OF<br>U308 | RECLAMATION STATUS            | CONDITION OF<br>RECALAMATION WORK          |
| Mesa I Mines Site                          | N/A                          | NND983466772                          |                                      |                              |                |                   |                               |  |
|  | Mesa I 1/4 Mine              | Mesa 1 1/4 Mine                       | Cov026                               | 14,575                       | 132            | 419               | Unreclaimed by NAMLRP         | Not Applicable                             |
|  | Mesa I 1/2 Mine              | Mesa 1 1/2 Mine                       | Cov027                               | 23,729                       | 7,555          | 33,436            | Unreclaimed by NAMLRP         | Not Applicable                             |
|  | Mesa I 1/2 West Mine         | Mesa 1 1/2 West Mine, 1 1/2 West Mine | NA-0322                              | 7,631                        | 0              | 0                 | Reclaimed by NAMLRP           | Unknown                                    |
|  | Mesa I 3/4 Incline           | Mesa 1-3/4 Incline                    | NA-0311                              | 8,361                        | 44,174         | 172,619           | Reclaimed by NAMLRP           | Unknown                                    |
|  | Mesa I 3/4, Mine No. 2, P150 | Mesa 1-3/4, Mine #2, P-150            | Cov033                               | 9,156                        | 6,423          | 32,365            | Partially Reclaimed by NAMLRP | Unknown                                    |
|  | Mesa I Mine 10               | Mesa 1 Mine #10                       | Mine 10                              | 11,629                       | 58,082         | 382,755           | Partially Reclaimed by NAMLRP | Unknown                                    |
|  | Mesa I Mine 11               | Mesa 1 Mine #11                       | NA-300, NA-310B,<br>NA-310C, NA-310D | 37,724                       |                |                   | Partially Reclaimed by NAMLRP | Waste Rock Remains On Steep<br>Mesa Slopes |
|  | Mesa I Mine 12               | Mesa 1 Mine #12                       | NA-300, NA-310B,<br>NA-310C, NA-310D | 102,879                      |                |                   | Partially Reclaimed by NAMLRP | Waste Rock Remains On Steep<br>Mesa Slopes |
|  | Mesa I Mine 13               | Mesa 1 Mine #13                       | NA-310A                              | 21,892                       |                |                   | Partially Reclaimed by NAMLRP | Soil Cap Partially Eroded In Some<br>Areas |
|  | Mesa I Mine 14               | Mesa 1 Mine #14                       | NA-300, NA-310B,<br>NA-310C, NA-310D | 36,253                       |                |                   | Partially Reclaimed by NAMLRP | Unknown                                    |
|  | Mesa I Mine 15               | Mesa 1 Mine #15                       | NA-300, NA-310B,<br>NA-310C, NA-310D | 29,784                       |                |                   | Partially Reclaimed by NAMLRP | Unknown                                    |









**Legend**

**Surface Water**

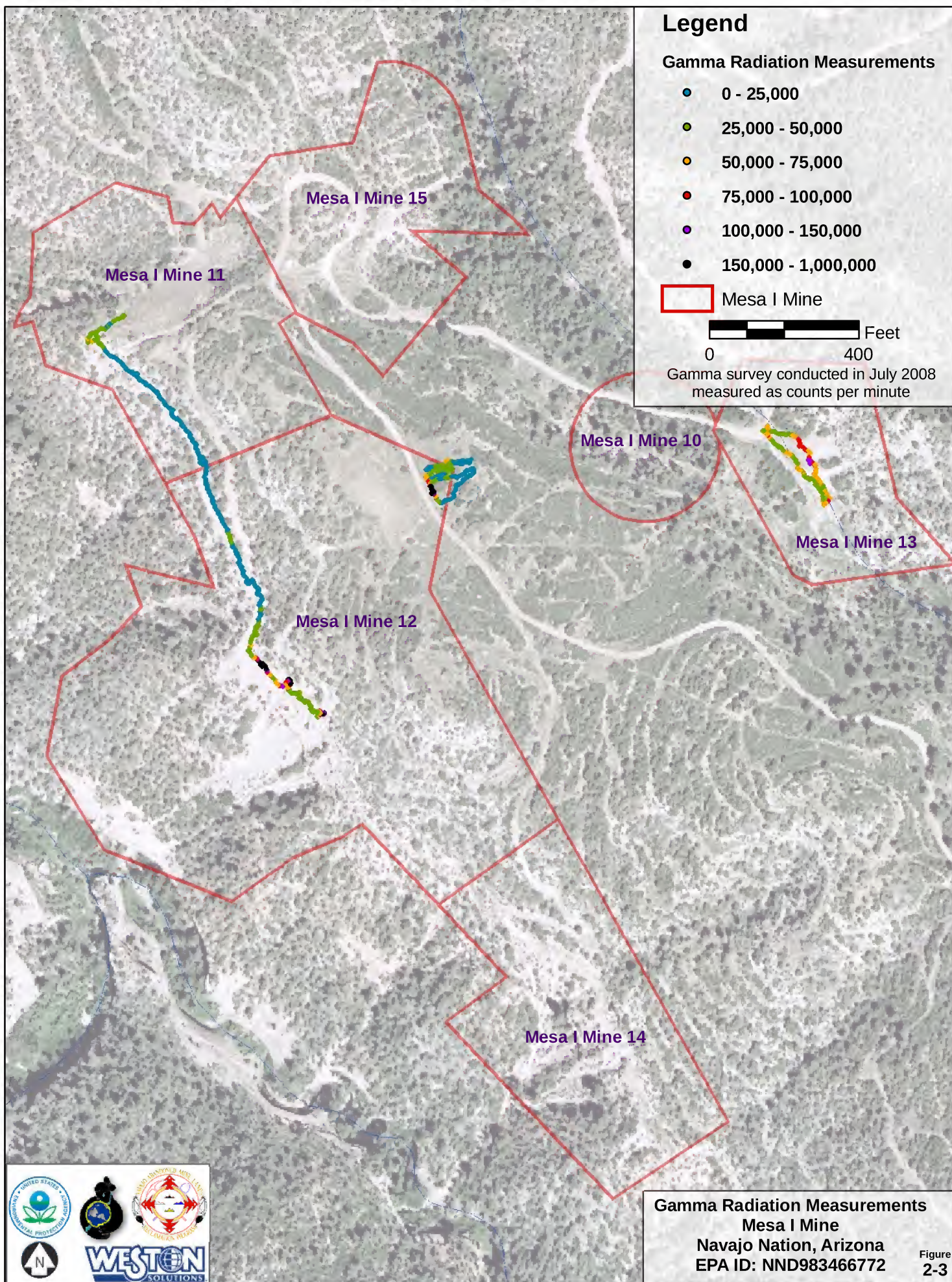
- Artificial Path
- Stream/River: Intermittent
- Stream/River: Perennial
- Mesa I Mine Location
- Mesa I Mine Partially Reclaimed by Navajo Abandoned Mines Reclamation Program
- Mesa I Mine Reclaimed by Navajo Abandoned Mines Reclamation Program

0 1,000 Feet



**Site Layout Map**  
**Mesa I Mine**  
 Navajo Nation, Arizona  
 EPA ID: NND983466772








## Legend

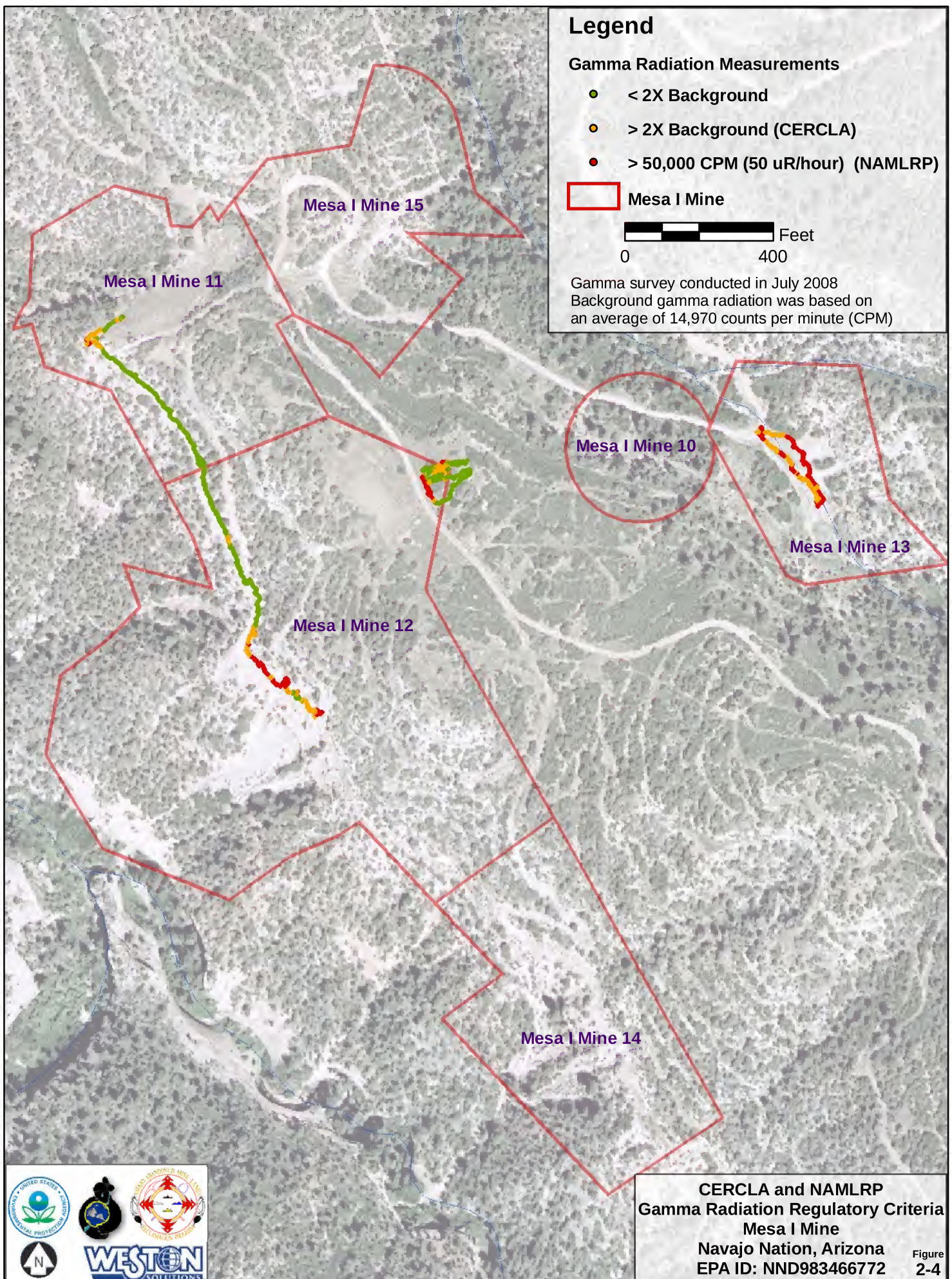
### Gamma Radiation Measurements

- < 2X Background
- > 2X Background (CERCLA)
- > 50,000 CPM (50 uR/hour) (NAMLRP)

 Mesa I Mine

 Feet  
0 400

Gamma survey conducted in July 2008  
Background gamma radiation was based on  
an average of 14,970 counts per minute (CPM)



CERCLA and NAMLRP  
Gamma Radiation Regulatory Criteria  
Mesa I Mine  
Navajo Nation, Arizona  
EPA ID: NND983466772

Figure  
2-4





**APPENDIX A:**  
**Transmittal List**

## **Appendix A Transmittal List**

**Date: August 22, 2008**

**Site Name: Mesa I Mines**

**EPA ID No.: NND983466772**

A copy of the Abbreviated Preliminary Assessment Report for the Mesa I Mines site should be sent to the following recipients:

Stanley Edison  
Navajo Nation Environmental Protection Agency  
Navajo Nation EPA  
P.O. Box 2946  
Window Rock, AZ 86515

Prestene Garnenez  
Navajo Tribal Utility Authority  
P.O. Box 170  
Fort Defiance, AZ 86504

Joe Ray Harvey  
Cove Chapter House  
P.O. Box 378  
Red River, AZ 86544

Melvin Yazzie  
Navajo AML Shiprock Office  
P.O. Box 3605  
Shiprock, NM 87420

**Appendix B**  
**Site Reconnaissance Interview and Observation Report/  
Photographic Documentation**

## **SITE RECONNAISSANCE INTERVIEW AND OBSERVATIONS REPORT**

DATE: July 1-2, 2008

OBSERVATIONS MADE BY: Joe DeFao, Weston Solutions, Inc. (WESTON)

SITE: Mesa I Mines

EPA ID: NND983466772

A site visit was conducted on July 1 and July 2, 2008. During the visit, gamma radiation readings were collected in some areas of the Mesa I Mines site using a combination sodium-iodide scintillation detector and a GPS unit. A stand-alone scintillation detector was used as well. The following information was obtained and photographs were taken during the site visit:

The weather was hot and sunny. The temperature was approximately 95°F.

On July 1, 2008, personnel from USEPA, NNEPA, and WESTON conducted a site visit of the Mesa I Mines. The following people were present: Jeff Inglis (USEPA), Stanley Edison (NNEPA), and Joe DeFao, Nels Johnson, and Tommy Evans (WESTON). The purpose of the visit was to provide WESTON with a general orientation of the mine sites in preparation for a more thorough site visit. The following day, on July 2, 2008, WESTON returned to the Mesa I Mines. Prior to returning to the site, WESTON notified personnel at the Cove Chapter House of the activities being conducted at the mines. In addition, WESTON inquired about the drinking water system used in the community of Cove. Chapter personnel identified Joe Ray Harvey (505-406-1708) as a contact. The Community of Cove is located approximately 3 miles north of the Mesa I Mines site.

Using maps and satellite imagery, WESTON attempted to locate the various mines that comprise the Mesa I site. The following mine sites were visited at the Mesa I Mines site: Mine 10, Mine 11, Mine 12, Mine 13, Mine 14, and Mine 15. Gamma radiation data was collected at Mine 11, Mine 12, and Mine 13. Gamma radiation was detected above background at all three mine sites. In some areas that were visited, particularly Mine 12, uranium ore outcroppings were exposed to the surface.

*Photographic Documentation  
Mesa I Mines Site  
Apache County, Arizona*



**Photo 1:** Potential reclaimed adit located at Mine 11.



**Photo 2:** WESTON employee holds sodium-iodide scintillation detector to exposed uranium ore at Mine 12.

*Photographic Documentation  
Mesa I Mines Site  
Apache County, Arizona*



**Photo 3:** Mine tailings at Mine 12 mesa ridge.



**Photo 4:** Area reclaimed by the Navajo Abandoned Mines Reclamation Program at Mine 13.



*Photographic Documentation  
Mesa I Mines Site  
Apache County, Arizona*



**Photo 5:** A WESTON employee collects gamma radiation readings in the drainage from the reclaimed portion of Mine 13.

**Appendix C**  
**Contact Log and Reports**

**SITE: Mesa I Mines**  
**EPA ID NO.: NND983466772**

| <b>Name</b>       | <b>Affiliation</b>              | <b>Phone</b>   | <b>Date</b> | <b>Information</b> |
|-------------------|---------------------------------|----------------|-------------|--------------------|
| Prestene Garnenez | Navajo Utility Tribal Authority | (928) 729-6221 | 08/08/08    | Contact Report 2   |
| Joe Ray Harvey    | Cove Chapter House Affiliate    | (505) 406-1708 | 08/07/08    | Contact Report 1   |



### CONTACT REPORT 1

|   |                              |                              |
|---|------------------------------|------------------------------|
| AGENCY/AFFILIATION: Cove Chapter House                      |                              |                              |
| DEPARTMENT: N/A   |                              |                              |
| ADDRESS/CITY: P.O. Box 378/Red River                        |                              |                              |
| COUNTY/STATE/ZIP: Apache/Arizona/86544                      |                              |                              |
| CONTACT(S)  | TITLE                        | PHONE                        |
| Joe Ray Harvey  | Cove Chapter House Affiliate | (505) 406-1708               |
| WESTON EMPLOYEE: Tara Fitzgerald                            |                              | DATE: 08/07/08               |
| SUBJECT: Groundwater use within 4 miles of the Mesa I Mines |                              |                              |
| SITE NAME: Mesa I Mines                                     |                              | CERCLIS ID NO.: NND983466772 |

I spoke with Joe Ray Harvey concerning groundwater use within 4 miles of the Mesa I Mines. Mr. Harvey stated that the Cottonwood Springs well, which is operated by the Bureau of Indian Affairs, provides water for approximately 100 people. The Cottonwood Springs well is an artesian well located approximately 3 miles from the Mesa I Mines site. Mr. Harvey also stated that other artesian wells operated by the Bureau of Indian Affairs were not used any longer due to lead and uranium contamination. Mr. Harvey was unable to state specifically which wells were no longer operated due to contamination with the exception of the Hidden Spring well.

Mr. Harvey also stated that the Navajo Tribal Utilities Authority (NTUA) operates wells in the area of Cove. Mr. Harvey stated that these wells are tested either quarterly or monthly for radiological contaminants. Approximately 300 people in Cove use water provided by the NTUA.

## CONTACT REPORT 2

|   |            |                              |
|---|------------|------------------------------|
| AGENCY/AFFILIATION: Navajo Tribal Utility Authority         |            |                              |
| DEPARTMENT: Environmental Compliance Laboratory             |            |                              |
| ADDRESS/CITY: P.O. Box 170/Fort Defiance                    |            |                              |
| COUNTY/STATE/ZIP: Apache/Arizona/86504                      |            |                              |
| CONTACT(S)  | TITLE      | PHONE                        |
| Prestene Garnenez   | Supervisor | (928) 729-6221               |
| WESTON EMPLOYEE: Tara Fitzgerald                            |            | DATE: 08/08/08               |
| SUBJECT: Groundwater use within 4 miles of the Mesa I Mines |            |                              |
| SITE NAME: Mesa I Mines                                     |            | CERCLIS ID NO.: NND983466772 |

Prestene Garnenez stated that the NTUA operates two wells serving the Cove area. The wells are 12T-7690 and 12T-666. Well 12T-7690 is currently offline due to radium contamination above the Maximum Contaminant Level of 5 µg/L. Ms. Garnenez was not aware of a well 12T-341 that was located within 4 miles of the Mesa I Mine site as of 1985. She stated that it was probably abandoned. Ms. Garnenez sent me a map of well 12T-666 (attached) but did not know where well 12T-7690 was located. Well 12T-666 is not located within 4 miles of the Mesa I Mines site.

## **Appendix D**

### **Latitude and Longitude Calculation Worksheet**

# Latitude and Longitude Calculation Worksheet (7.5' quads) Using an Engineer's Scale (1/50)

Site Name  CERCLIS #

AKA

Address

City  State  ZIP

Site Reference Point

USGS Quad Name  Scale

Township  Range  Section   1/4  1/4  1/4

Map Datum ☐ 1927 ☐ 1983 (Check one) Meridian

Map coordinates at southeast corner of 7.5' quadrangle (attach photocopy)

Latitude  °  '  "N Longitude  °  '  "W

Map coordinates at southeast corner of 2.5' grid cell

Latitude  °  '  "N Longitude  °  '  "W

## Calculations

### LATITUDE(x)

A) Number of ruler graduations between 2.5' (150") grid lines  (a)

B) Number of ruler graduations between south grid line and the site reference point  (b)

C) Therefore,  $a/150 = b/x$ , where  $x$  = Latitude in decimal seconds, north of the south grid line

Expressed as minutes and seconds ( $1' = 60''$ ) =  °  '  "N

Add to grid cell latitude =  °  '  "N +  °  '  "N

Site latitude =  3 6 ° 3 1 ' 2 0 "N"

### LONGITUDE(y)

A) Number of ruler graduations between 2.5' (150") grid lines  (a)

B) Number of ruler graduations between south grid line and the site reference point  (b)

C) Therefore,  $a/150 = b/x$ , where  $x$  = Longitude in decimal seconds, west of the east grid line

Expressed as minutes and seconds ( $1' = 60''$ ) =  °  '  "W

Add to grid cell longitude =  °  '  "N +  °  '  "N

Site longitude =  1 0 9 ° 1 2 ' 4 9 "W"

## **Appendix E**

### **References**

**Appendix F**  
**EPA Quick Reference Fact Sheet: *Site Assessment: Evaluating  
Risks at Superfund Sites***



# SITE ASSESSMENT: Evaluating Risks at Superfund Sites

Office of Emergency and Remedial Response  
Hazardous Site Evaluation Division 5204G

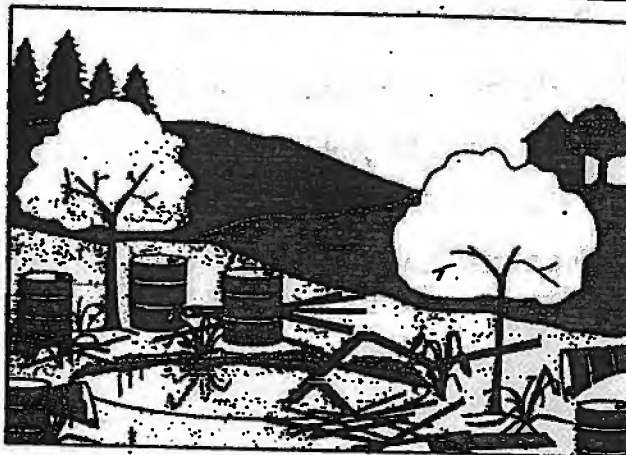
Quick Reference Fact Sheet

## The Challenge of the Superfund Program

A series of headline-grabbing stories in the late 1970s, such as Love Canal, gave Americans a crash course in the perils of ignoring hazardous waste. At that time, there were no Federal regulations to protect the country against the dangers posed by hazardous substances (mainly industrial chemicals, accumulated pesticides, cleaning solvents, and other chemical products) abandoned at sites throughout the nation. And so, in 1980 Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, to address these problems.

The major goal of the Superfund program is to protect human health and the environment by cleaning up areas, known as "sites," where hazardous waste contamination exists. The U.S. Environmental Protection Agency (EPA) is responsible for implementing the Superfund program.

At the time it passed the Superfund law, Congress believed that the problems associated with uncontrolled releases of hazardous waste could be



handled in five years with \$1.6 billion dollars. However, as more and more sites were identified, it became apparent that the problems were larger than anyone had originally believed. Thus, Congress passed the Superfund Amendments and Reauthorization Act (SARA) in 1986. SARA expanded and strengthened the authorities given to EPA in the original legislation and provided a budget of \$8.5 billion over five years. Superfund was extended for another three years in 1991.

## What is EPA's Job at Superfund Sites?

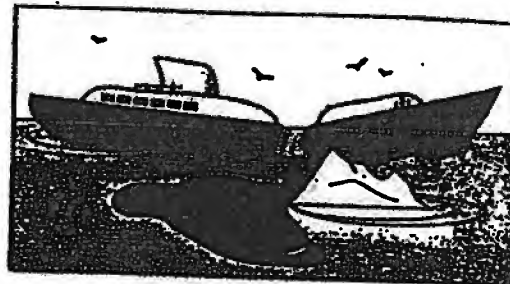
For more than 10 years, EPA has been implementing the Superfund law by:

- Evaluating potential hazardous waste sites to determine if a problem exists;
- Finding the parties who caused the hazardous waste problems and directing them to address these problems under EPA oversight or requiring them to repay EPA for addressing these problems; and
- Reducing immediate risks and tackling complex hazardous waste problems.

The Superfund site assessment process generally begins with the discovery of contamination at a site and ends with the completion of remediation (i.e., cleaning up the waste at a site) activities. This fact sheet explains the early part of the process, called the *site assessment* phase.

## The National Response Center

The National Response Center (NRC), staffed by Coast Guard personnel, is the primary agency to contact for reporting all oil, chemical, and biological discharges into the environment anywhere in the U.S. and its territories. It is responsible for:



- ☛ Maintaining a telephone hotline 365 days a year, 24 hours a day;
- ☛ Providing emergency response support in specific incidents; and
- ☛ Notifying other Federal agencies of reports of pollution incidents.

To report a pollution incident, such as an oil spill, a pipeline system failure, or a transportation accident involving hazardous material, call the NRC hotline at 800-424-8802.

# 1

### Site Discovery

Hazardous waste sites are discovered in various ways. Sometimes concerned residents find drums filled with unknown substances surrounded by dead vegetation and call the NRC, EPA, or the State environmental agency; or an anonymous caller to the NRC or EPA reports suspicious dumping activities. Many sites come to EPA's attention through routine inspections conducted by other Federal, State, or local government officials. Other sites have resulted from a hazardous waste spill or an explosion. EPA enters these sites into a computer system that tracks any future Superfund activities.

# 2

### Preliminary Assessment

After learning about a site, the next step in the site assessment process is to gather existing information about the site. EPA calls this the *preliminary assessment*. Anyone can request that a preliminary assessment be performed at a site by petitioning EPA, the State environmental agency, local representatives, or health officials.

During the preliminary assessment, EPA or the State environmental agency:

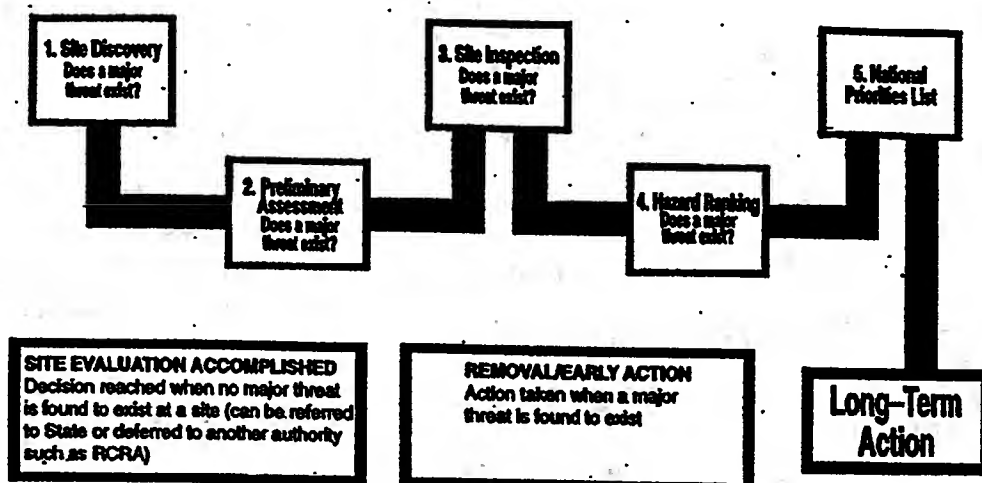
- ◆ Reviews available background records;
- ◆ Determines the size of the site and the area around it;

- ◆ Tries to determine whether hazardous substances are involved;
- ◆ Identifies actual or potential pollution victims, such as the nearby population and sensitive environments;
- ◆ Makes phone calls or interviews people who may be familiar with the site; and
- ◆ Evaluates the need for early action using EPA's removal authority.

By gathering information and possibly visiting the site, EPA or the State environmental agency is able to determine if major threats exist and if cleanup is needed. Many times, the preliminary assessment indicates that no major threats exist.



## The Site Assessment Process



**However, if hazardous substances do pose an immediate threat, EPA quickly acts to address the threat.** When a site presents an immediate danger to human health or the environment—for example, there is the potential for a fire or an explosion or the drinking water is contaminated as a result of hazardous substances leaking out of drums—EPA can move quickly to address site contamination. This action is called a *removal* or an *early action*. Additional information on early actions can be found on page 4.

EPA or the State environmental agency then decides if further Federal actions are required. Of the more than 35,000 sites discovered since 1980, only a small percentage have needed further remedial action under the Federal program.

A report is prepared at the completion of the preliminary assessment. The report includes a description of any hazardous substance release, the possible source of the release, whether the contamination could endanger people or the environment, and the pathways of the release. The information outlined in this report is formed into hypotheses that are tested if further investigation takes place. You can request a copy of this report once it becomes final—just send your name and address to your EPA regional Superfund office. See page 8 for further information on these contacts.

Sometimes it is difficult to tell if there is contamination at the site based on the initial information gathering. When this happens, EPA moves on to the next step of the site assessment, called the *site inspection*.

## Making Polluters Pay

One of the major goals of the Superfund program is to have the responsible parties pay for or conduct remedial activities at hazardous waste sites. To accomplish this goal, EPA:

- ◆ Researches and determines who is responsible for contaminating the site;
- ◆ Issues an order requiring the private parties to perform cleanup actions with EPA oversight; and
- ◆ Recovers costs that EPA spends on site activities from the private parties.

## Removals/Early Actions

EPA can take action quickly if hazardous substances pose an immediate threat to human health or the environment. These actions are called *removals* or *early actions* because EPA rapidly eliminates or reduces the risks at the site. EPA can take a number of actions to reduce risks, including:

- ◆ Fencing the site and posting warning signs to secure the site against trespassers;
- ◆ Removing, containing, or treating the source of the contamination;
- ◆ Providing homes and businesses with safe drinking water; and, as a last resort,
- ◆ Temporarily relocating residents away from site contamination.

**"EPA can take action quickly if hazardous substances pose an immediate threat to human health or the environment."**

# 3

## Site Inspection

If the preliminary assessment shows that hazardous substances at the site may threaten residents or the environment, EPA performs a site inspection. During the site inspection, EPA or the State collects samples of the suspected hazardous substances in nearby soil and water. EPA may initiate a concurrent SI/remedial investigation at those sites that are most serious and determined early as requiring long-term action. Sometimes, wells have to be drilled to sample the ground water. Site inspectors may wear protective gear, including coveralls and respirators, to protect themselves against any hazardous substances present at the site. Samples collected during the site inspection are sent to a laboratory for analysis to help EPA answer many questions, such as:

- ◆ Are hazardous substances present at the site? If so, what are they, and approximately

how much of each substance is at the site?

- ◆ Have these hazardous substances been released into the environment? If so, when did the releases occur, and where did they originate?
- ◆ Have people been exposed to the hazardous substances? If so, how many people?
- ◆ Do these hazardous substances occur naturally in the immediate area of the site? At what concentrations?
- ◆ Have conditions at the site gotten worse since the preliminary assessment? If so, is an early action or removal needed? (See box above.)

Often, the site inspection indicates that there is no release of major contamination at the site, or that the hazardous substances are safely contained and have no possibility of being released into the environment. In these situations, EPA decides that no further Federal inspections or remedial actions are needed. This decision is referred to as *site evaluation accomplished*. (See page 5 for more details on the *site evaluation accomplished* decision.)

At the completion of the site inspection, a report is prepared. This report is available to the public—call your EPA regional Superfund office for a copy. See page 8 for the phone numbers of these offices.

**"During the site inspection, EPA or the State collects samples of the suspected hazardous substances in nearby soil and water."**

At sites with particularly complex conditions, EPA may need to perform a second SI to obtain legally defensible documentation of the releases.

Because EPA has limited resources, a method has been developed to rank the sites and set priorities throughout the nation. That method, known as the *Hazard Ranking System*, is the next step in the site assessment process.

# 4

## Hazard Ranking System

EPA uses the information collected during the preliminary assessment and site inspection to evaluate the conditions at the site and determine the need for long-term remedial actions. When evaluating the seriousness of contamination at a site, EPA asks the following questions:

- ◆ Are people or sensitive environments, such as wetlands or endangered species, on or near the site?
- ◆ What is the toxic nature and volume of waste at the site?
- ◆ What is the possibility that a hazardous substance is in or will escape into ground water, surface water, air, or soil?

Based on answers to these questions, each site is given a score between zero and 100. Sites that score 28.5 or above move to the next step in the process: listing on the *National Priorities List*. Sites that score below 28.5 are referred to the State for further action.

# 5

## National Priorities List

Sites that are listed on the *National Priorities List* present a potential threat to human health and the environment, and require further study to determine what, if any, remediation is necessary. EPA can pay for and conduct

## Site Evaluation Accomplished

In many instances, site investigators find that potential sites do not warrant Federal action under the Superfund program. This conclusion can be attributed to one of two reasons:

- ◆ The contaminants present at the site do not pose a major threat to the local population or environment; or
- ◆ The site should be addressed by another Federal authority, such as EPA's Resource Conservation and Recovery Act (RCRA) hazardous waste management program.

When investigators reach this conclusion, the site evaluation is considered accomplished. A site can reach this point at several places during the site assessment process, namely at the conclusion of the preliminary assessment or the site inspection, or once the site is scored under the Hazard Ranking System.

remedial actions at NPL sites if the responsible parties are unable or unwilling to take action themselves. There are three ways a site can be listed on the National Priorities List:

- ◆ It scores 28.5 or above on the Hazard Ranking System;
- ◆ If the State where the site is located gives it top priority, the site is listed on the National Priorities List regardless of the HRS score; or
- ◆ EPA lists the site, regardless of its score, because all of the following are true about the site:

- ▼ The Agency for Toxic Substances and Disease Registry (ATSDR), a group within the U.S. Public Health Service, issues a health advisory recommending that the local population be *dissociated* from the site (i.e., that the people be temporarily relocated or the immediate public health threat be removed);
- ▼ EPA determines that the site poses a significant threat to human health; and
- ▼ Conducting long-term remediation activities will be more effective than

addressing site contamination through early actions.

The list of proposed sites is published in the *Federal Register*, a publication of legal notices issued by Federal agencies. The community typically has 60 days to comment on the list. After considering all comments, EPA publishes a list of those sites that are officially on the National Priorities List. When a site is added to the National Priorities List, the site assessment is completed. Long-term actions take place during the next phase. See page 6 for more details on long-term actions.

## As a Concerned Citizen, How Can I Help?

- ☛ Read this fact sheet.
- ☛ Call EPA with any potential sites in your area.
- ☛ Provide EPA with site information.
- ☛ Comment on proposed listing of sites on the National Priorities List.
- ☛ If the site is listed on the NPL, work with your citizens' group to apply for a technical assistance grant.



## Addressing Sites in the Long Term

Once a site is placed on the National Priorities List, it enters the long-term or remedial phase. The stages of this phase include:

- ✓ Investigating to fully determine the nature and extent of contamination at the site, which can include a public health assessment done by the ATSDR;
- ✓ Exploring possible technologies to address site contamination;
- ✓ Selecting the appropriate technologies—also called remedies;
- ✓ Documenting the selected remedies in a record of decision (ROD);
- ✓ Designing and constructing the technologies associated with the selected remedies;
- ✓ If necessary, operating and maintaining the technologies for several years (e.g., long-term treatment of ground water) to ensure safety levels are reached; and
- ✓ Deleting the site from the National Priorities List, completing Superfund's process and mission.



## Some Commonly Asked Questions

**Q:** What exactly is a site?

**A:** EPA designates the area in which contamination exists as the "site." Samples are taken to define the area of contamination. At any time during the cleanup process the site may be expanded if contamination is discovered to have spread further.

**Q:** How long will it take to find out if a threat exists?

**A:** Within one year of discovering the site, EPA must perform a preliminary assessment. The preliminary assessment allows EPA to determine if there is an immediate danger at the site; if so, EPA takes the proper precautions. You will be notified if you are in danger. EPA may also contact you to determine what you know about the site.

**Q:** What is the State's role in all these investigations?

**A:** The State can take the lead in investigating and addressing contamination. It also provides EPA with background information on (1) immediate threats to the population or environment, and (2) any parties that might be responsible for site contamination. The State shares in the cost of any long-term actions conducted by the Superfund program, comments on the proposal of sites to the National Priorities List, and concurs on the selected remedies and final deletion of sites from the National Priorities List.

**Q:** Why are private contractors used to assess sites?

**A:** EPA has a limited workforce. By using private contractors, EPA is able to investigate more sites. Also, EPA is able to draw on the expertise of private contracting companies.

**Q:** Why are there so many steps in the evaluation process? Why can't you just take away all the contaminated materials right now, just to be safe?

**A:** When EPA assesses a site, it first determines if contamination poses any threats to the health of the local population and the integrity of the environment. Dealing with worst sites first is one of Superfund's national goals. By evaluating contamination in a phased approach, EPA can quickly identify sites that pose the greatest threats and move them through the site assessment process. Once EPA understands the conditions present at a site, it searches for the remedy that will best protect public health and the environment. Cost is only one factor in weighing equally protective remedies. Many sites do not warrant actions because no major threat exists. However, if a significant threat does exist, EPA will take action.

## **AMENDMENT TO PRELIMINARY ASSESSMENT REPORT**

### **MESA I MINES**

**EPA ID No. NND983466772**

Originally Submitted by Weston Solutions, Inc  
August 2008

A Preliminary Assessment (PA) report was completed for the Mesa I Mines (EPA ID No. NND983466772), submitted to the United States Environmental Protection Agency (EPA) Region 9, by Weston Solutions, Inc (Weston) in August, 2008. Following the completion of the 2008 PA report, the EPA and Weston acquired additional information pertaining to the 11 individual mines which constitute the Mesa I Mines site.

In June, 2010, EPA tasked Weston with revisiting the Mesa I Mines, as part of the continuing Navajo Abandoned Uranium Mines (AUM) radiological screening project. As part of a limited site screen, new gamma radiation measurements, additional site reconnaissance and further documentation took place at each site. The gamma radiation measurement results, site photographs, and gamma radiation maps from the 2010 limited site screens are presented in the following pages.

## Summary of radiological readings

**Site:** Mesa I, Mine No. 11

**Mine ID:** 93

### Highest gamma radiation measurement:

805,281 counts per minute (cpm)

### Describe any other radiological measurements:

A total of 4,643 gamma radiation measurements were collected from the mine site, ranging from 7,054 cpm to 805,281 cpm. The measurements are represented in Figures A-1 and A-2.

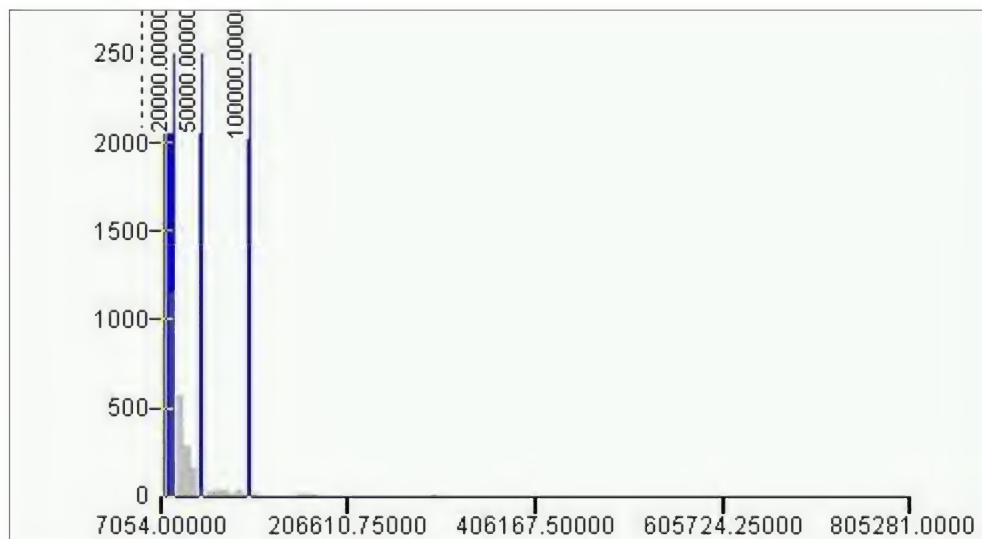
### Background Locations

#1 15,624 cpm

**Average background = 15,624 cpm**

### Distribution Chart and Statistics:

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                 |
|---------------------|-----------------|
| Count:              | 4634            |
| Minimum:            | 7054.00000      |
| Maximum:            | 805281.00000    |
| Sum:                | 148520871.00000 |
| Mean:               | 32050.25270     |
| Median:             | 15729.50000     |
| Standard Deviation: | 72274.65668     |





Photo 1. Mesa I, Mine No. 11 (93) site



Photo 2. Mesa I, Mine No. 11 (93) site





Photo 3. Mesa I, Mine No. 11 (93) site



Photo 4. Mesa I, Mine No. 11 (93) site





Photo 5. Mesa I, Mine No. 11 (93) site

**Site:** Mesa I, Mine No. 13**Mine ID:** 94**Highest gamma radiation measurement:**

235,955 counts per minute (cpm)

**Describe any other radiological measurements:**

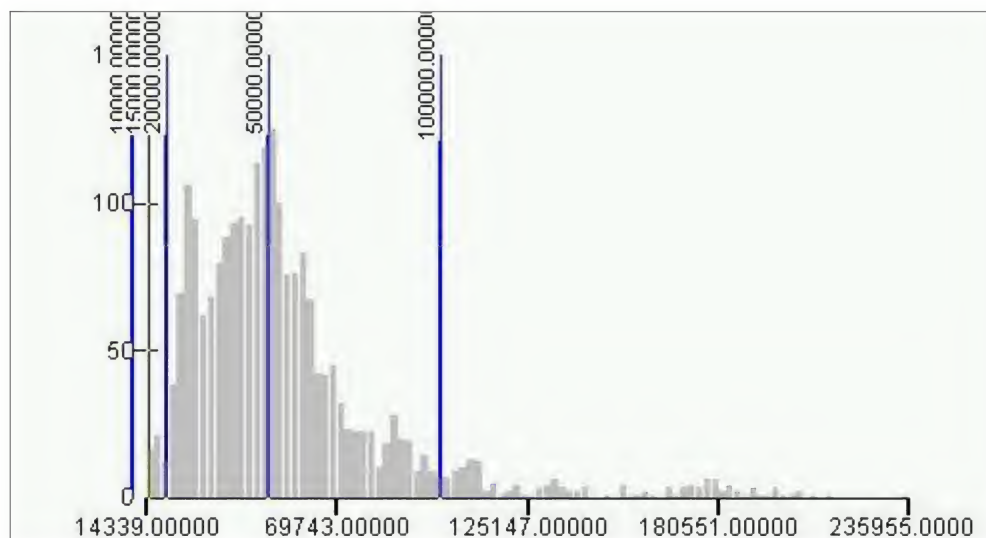
A total of 2,224 gamma radiation measurements were collected from the mine site, ranging from 14,339 cpm to 235,955 cpm. The measurements are represented in Figures A-1 and A-2.

**Background Locations**

#1 14,842 cpm

**Average background = 14,842 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                 |
|---------------------|-----------------|
| Count:              | 2224            |
| Minimum:            | 14339.00000     |
| Maximum:            | 235955.00000    |
| Sum:                | 122129685.00000 |
| Mean:               | 54914.42671     |
| Median:             | 48826.50000     |
| Standard Deviation: | 30279.81513     |



Photo 1. Mesa I, Mine No. 13 (94) site



Photo 2. Mesa I, Mine No. 13 (94) site





Photo 3. Mesa I, Mine No. 13 (94) site



Photo 4. Mesa I, Mine No. 13 (94) site

**Site:** Mesa I ¾ Incline**Mine ID:** 95**Highest gamma radiation measurement:**

12,145

**Describe any other radiological measurements:**

Due to poor satellite coverage throughout the general vicinity of the site, gamma radiation measurements were collected manually, and individual waypoints were marked at each measurement location. A total of 14 gamma radiation measurements were collected from the mine site, ranging from 10,768 cpm to 12,145 cpm. The measurements are represented in Figures A-3 and A-4.

**Background Locations**

#1 10,322

**Average background = 10,322****Distribution Chart and Statistics:**

None





Photo 1. Mesa I  $\frac{3}{4}$  Incline (95) site



Photo 2. Mesa I  $\frac{3}{4}$  Incline (95) site





Photo 3. Mesa I  $\frac{3}{4}$  Incline (95) site



Photo 4. Mesa I  $\frac{3}{4}$  Incline (95) site



Photo 5. Mesa I  $\frac{3}{4}$  Incline (95) site



**Site:** Mesa I ½ , West Mine

**Mine ID:** 288

**Highest gamma radiation measurement:**

None

**Describe any other radiological measurements:**

Weston was unable to access the site, all known paths to the site were impassible. A site map is represented in Figure A-5.

**Background Locations**

None

**Average background =** None

**Distribution Chart and Statistics:**

None



Photo 1. Mesa I ½, West Mine (288) site

**Site:** Mesa I ½ Mine

**Mine ID:** 419

**Highest gamma radiation measurement:**

None

**Describe any other radiological measurements:**

Weston was unable to access the site, all known paths to the site were impassible. A site map is represented in Figure A-5.

**Background Locations**

None

**Average background =** None

**Distribution Chart and Statistics:**

None



Photo 1. Mesa I ½ Mine (419) site



Photo 2. Mesa I ½ Mine (419) site



**Site:** Mesa I ¼ Mine**Mine ID:** 423**Highest gamma radiation measurement:**

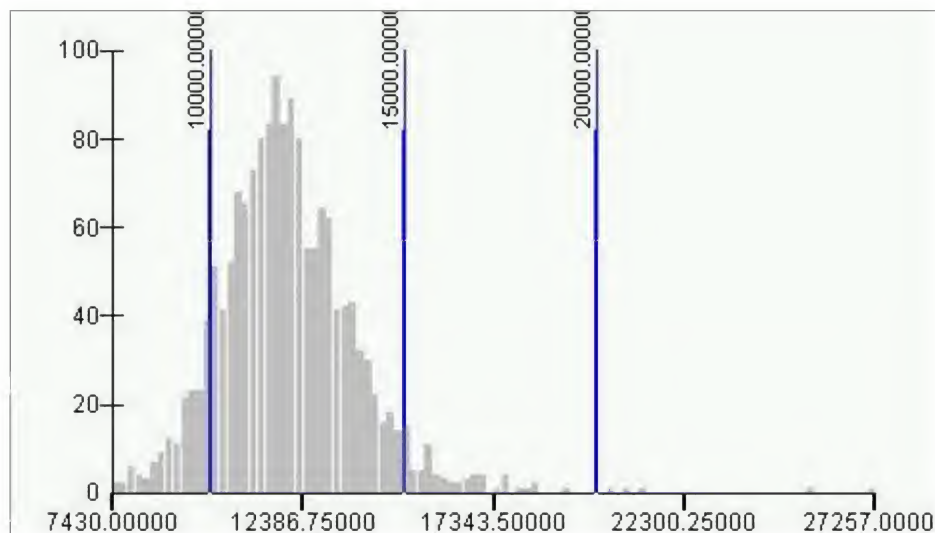
27,257 counts per minute (cpm)

**Describe any other radiological measurements:**

A total of 1,588 gamma radiation measurements were collected from the mine site, ranging from 7,430 cpm to 27,257 cpm. The measurements are represented in Figures A-6 and A-7.

**Background Locations**  
#1 11,377 cpm**Average background = 11,377 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                |
|---------------------|----------------|
| Count:              | 1588           |
| Minimum:            | 7430.00000     |
| Maximum:            | 27257.00000    |
| Sum:                | 19051033.00000 |
| Mean:               | 11996.87217    |
| Median:             | 11850.00000    |
| Standard Deviation: | 1773.03380     |



Photo 1. Mesa I ¼ Mine (423) site



Photo 2. Mesa I ¼ Mine (423) site





Photo 3. Mesa I ¼ Mine (423) site



Photo 4. Mesa I ¼ Mine (423) site





Photo 5. Mesa I ¼ Mine (423) site



Photo 6. Mesa I ¼ Mine (423) site





Photo 7. Mesa I ¼ Mine (423) site

**Site:** Mesa I ¾ Mine No. 2, P150**Mine ID:** 600**Highest gamma radiation measurement:**

39,480

**Describe any other radiological measurements:**

Due to poor satellite coverage throughout the general vicinity of the site, gamma radiation measurements were collected manually, and individual waypoints were marked at each measurement location. A total of 11 gamma radiation measurements were collected from the mine site, ranging from 14,289 cpm to 39,480 cpm. The measurements are represented in Figures A-8 and A-9.

**Background Locations**

#1 13,989

**Average background = 13,989****Distribution Chart and Statistics:**

None



Photo 1. Mesa I  $\frac{3}{4}$  Mine No. 2, P150 (600) site



Photo 2. Mesa I  $\frac{3}{4}$  Mine No. 2, P150 (600) site





Photo 3. Mesa I  $\frac{3}{4}$  Mine No. 2, P150 (600) site

**Site:** Mesa I, Mine No. 10**Mine ID:** 654**Highest gamma radiation measurement:**

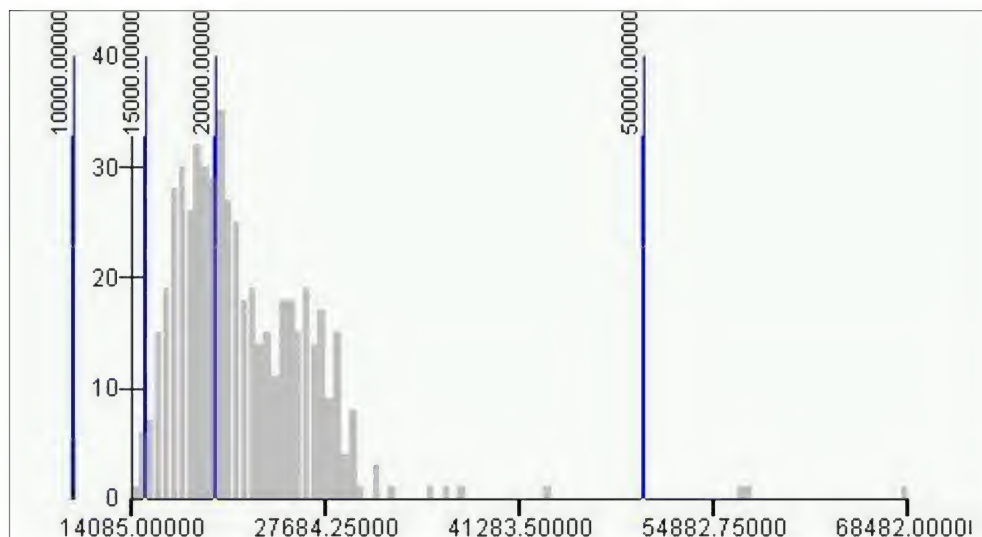
68,482 counts per minute (cpm)

**Describe any other radiological measurements:**

A total of 536 gamma radiation measurements were collected from the mine site, ranging from 14,085 cpm to 68,482 cpm. The measurements are represented in Figures A-1 and A-2.

**Background Locations**  
#1 14,842 cpm**Average background = 14,842 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                |
|---------------------|----------------|
| Count:              | 536            |
| Minimum:            | 14085.00000    |
| Maximum:            | 68482.00000    |
| Sum:                | 11721989.00000 |
| Mean:               | 21869.38246    |
| Median:             | 20777.50000    |
| Standard Deviation: | 5084.14379     |



Photo 1. Mesa I, Mine No. 10 (654) site



**Site:** Mesa I, Mine No. 12**Mine ID:** 655**Highest gamma radiation measurement:**

999,960 counts per minute (cpm)

**Describe any other radiological measurements:**

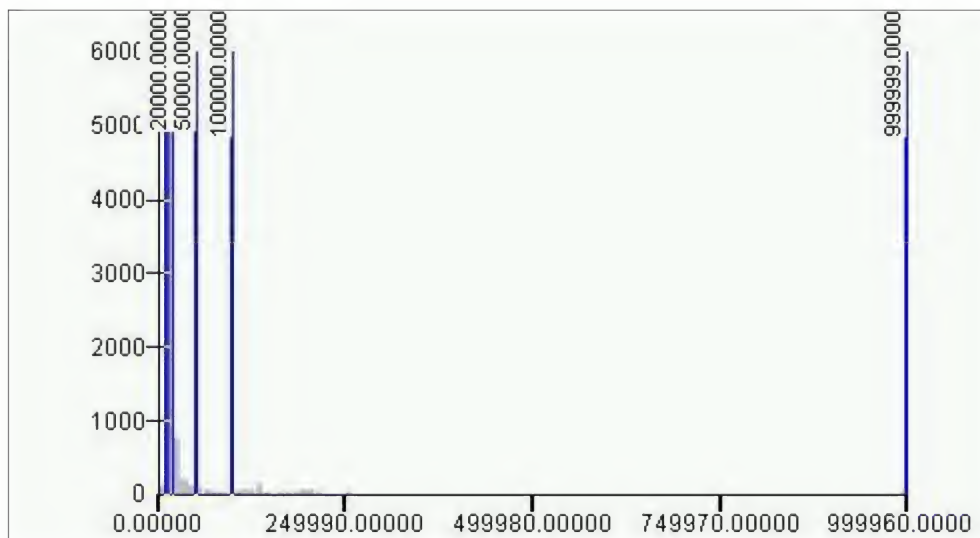
A total of 7,736 gamma radiation measurements were collected from the mine site, ranging from 14,568 cpm to 999,960 cpm. Measurements collected in the vicinity of the waste debris were found at levels up to approximately 1,000,000 cpm (the maximum gamma radiation level the equipment can detect). The measurements are represented in Figures A-1 and A-2.

**Background Locations**

#1 15,893 cpm

**Average background = 15,893 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                 |
|---------------------|-----------------|
| Count:              | 7736            |
| Minimum:            | 0.00000         |
| Maximum:            | 999960.00000    |
| Sum:                | 304136087.00000 |
| Mean:               | 39314.38560     |
| Median:             | 15526.50000     |
| Standard Deviation: | 96164.30029     |



Photo 1. Mesa I, Mine No. 12 (655) site



Photo 2. Mesa I, Mine No. 12 (655) site





Photo 3. Mesa I, Mine No. 12 (655) site



Photo 4. Mesa I, Mine No. 12 (655) site





Photo 5. Mesa I, Mine No. 12 (655) site



Photo 6. Mesa I, Mine No. 12 (655) site



Photo 7. Mesa I, Mine No. 12 (655) site



**Site:** Mesa I, Mine No. 14**Mine ID:** 656**Highest gamma radiation measurement:**

999,960 counts per minute (cpm)

**Describe any other radiological measurements:**

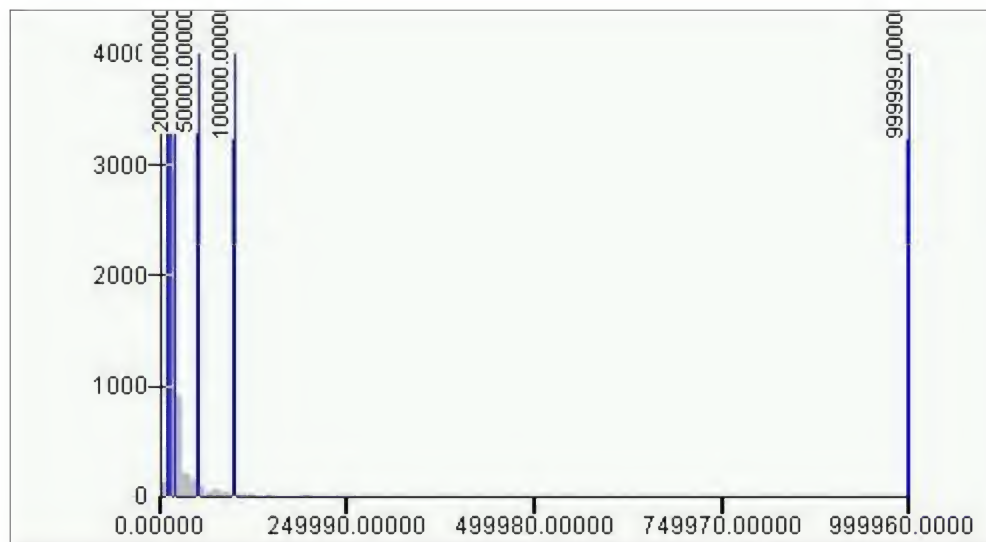
A total of 5,311 gamma radiation measurements were collected from the mine site, ranging from 11,456 cpm to 999,960 cpm. Measurements collected in the vicinity of the waste debris were found at levels up to approximately 1,000,000 cpm (the maximum gamma radiation level the equipment can detect). The measurements are represented in Figures A-1 and A-2.

**Background Locations**

#1 12,417 cpm

**Average background = 12,417 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |                 |
|---------------------|-----------------|
| Count:              | 5311            |
| Minimum:            | 0.00000         |
| Maximum:            | 999960.00000    |
| Sum:                | 138020056.00000 |
| Mean:               | 25987.58351     |
| Median:             | 17161.00000     |
| Standard Deviation: | 43411.64480     |





Photo 1. Mesa I, Mine No. 14 (656) site



Photo 2. Mesa I, Mine No. 14 (656) site

**Site:** Mesa I, Mine No. 15**Mine ID:** 657**Highest gamma radiation measurement:**

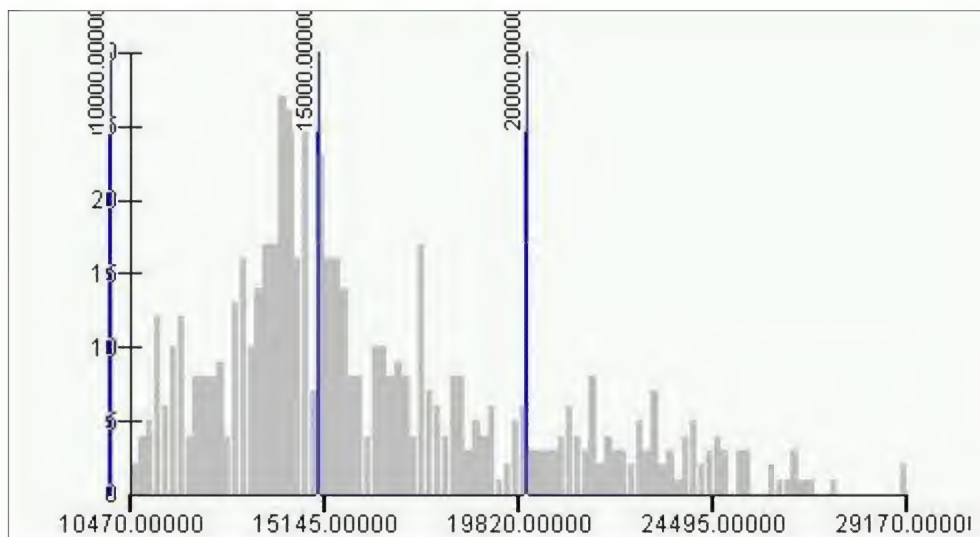
999,960 counts per minute (cpm)

**Describe any other radiological measurements:**

A total of 611 gamma radiation measurements were collected from the mine site, ranging from 10,470 cpm to 999,960 cpm. The measurements are represented in Figures A-1 and A-2.

**Background Locations**  
#1 12,471 cpm**Average background = 12,471 cpm****Distribution Chart and Statistics:**

The following chart and statistics were generated by ESRI ArcGIS 9.3.1, and show the general distribution of the site gamma radiation measurements. The horizontal X axis represents the gamma radiation reading levels in cpm (lowest levels to the left). The vertical Y axis represents the frequency of each gamma radiation level.



|                     |               |
|---------------------|---------------|
| Count:              | 611           |
| Minimum:            | 10470.00000   |
| Maximum:            | 29170.00000   |
| Sum:                | 9972044.00000 |
| Mean:               | 16320.85761   |
| Median:             | 15196.00000   |
| Standard Deviation: | 3826.17518    |





Photo 1. Mesa I, Mine No. 15 (657) site



Photo 2. Mesa I, Mine No. 15 (657) site





Photo 3. Mesa I, Mine No. 15 (657) site



Photo 4. Mesa I, Mine No. 15 (657) site

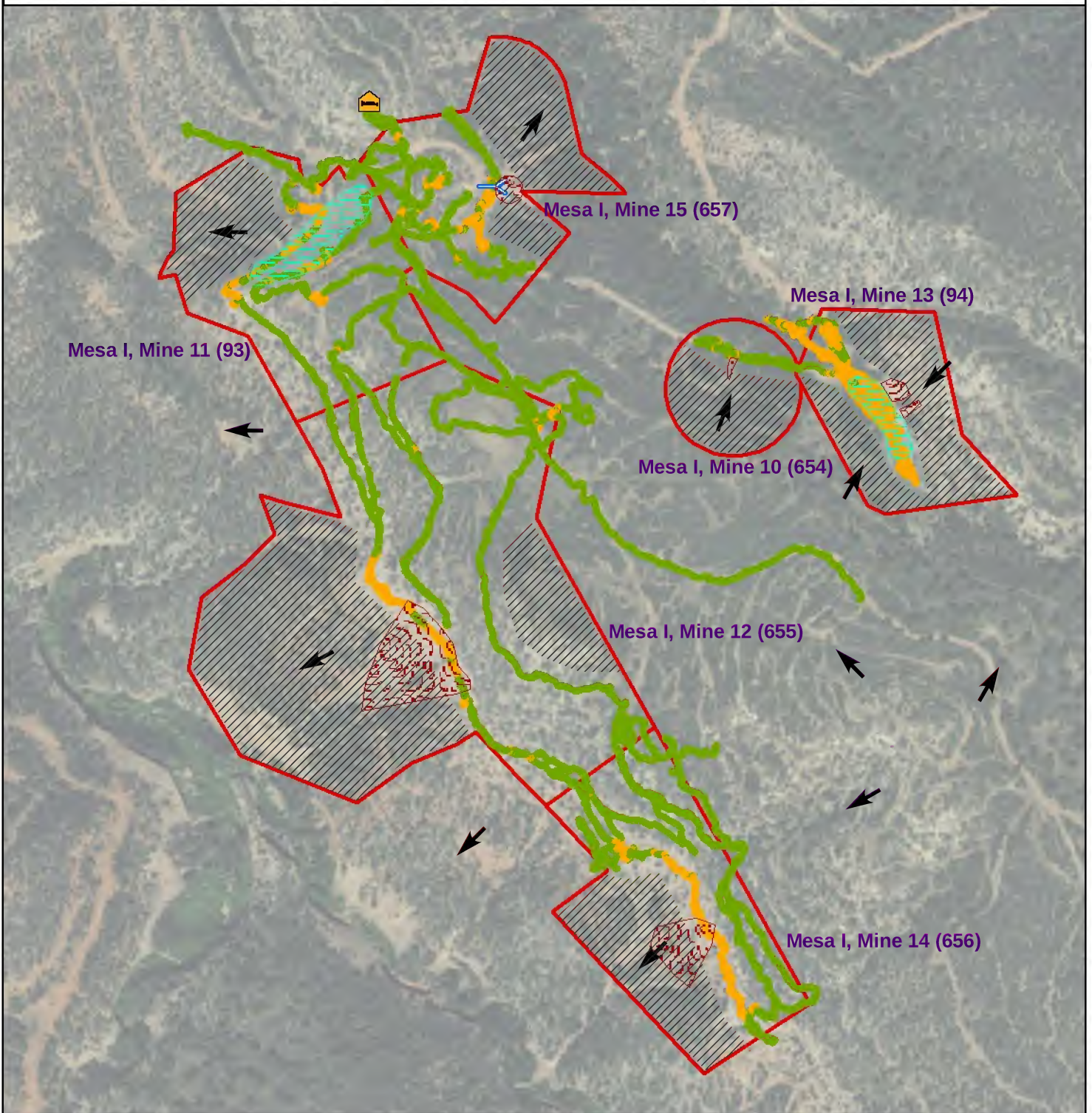


Photo 5. Mesa I, Mine No. 15 (657) site

## **FIGURES**



**Figure A-1 - Gamma Radiation Measurements, Above Two Times Background  
Mesa I, Mine No. 10 - 15 (93, 94, 654, 655, 656, 657)  
Cove Chapter, Navajo Nation**



### Legend

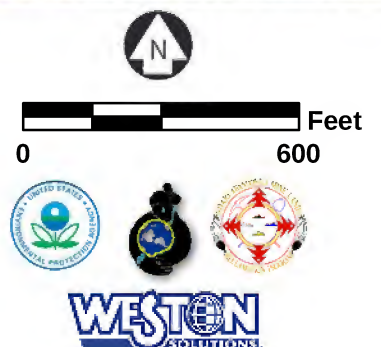
#### Gamma Radiation Measurements

- < 2X Background
- > 2X Background

Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

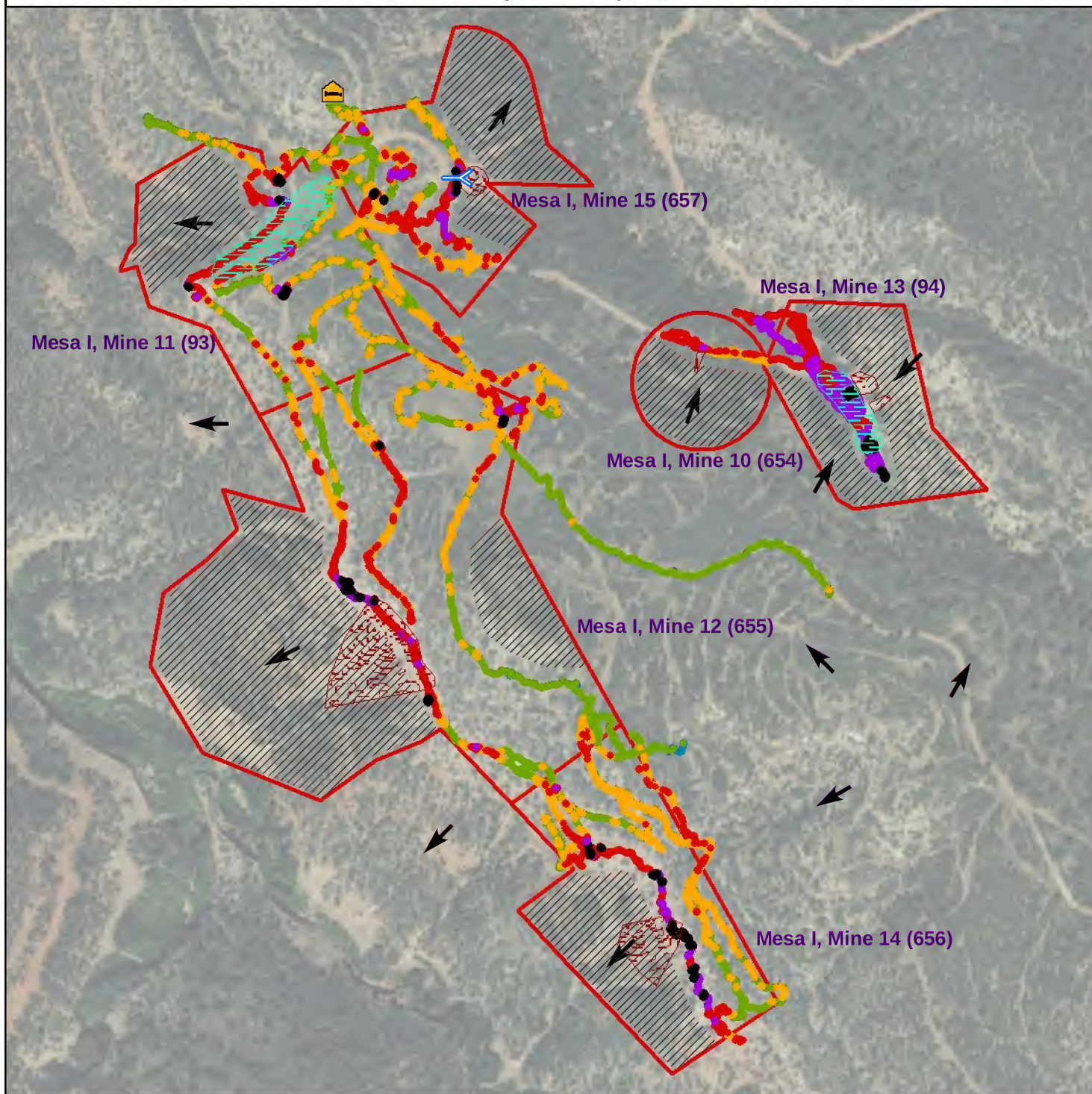
Average background = 14,348 cpm

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Observed Waste Pile
- ▨ Observed Reclamation Cap
- ▨ Inaccessible due to steep grades
- 🏠 Observed Housing Structure
- ➡ Observed Adit





**Figure A-2 - Gamma Radiation Measurements**  
**Mesa I, Mine No. 10 - 15 (93, 94, 654, 655, 656, 657)**  
**Cove Chapter, Navajo Nation**



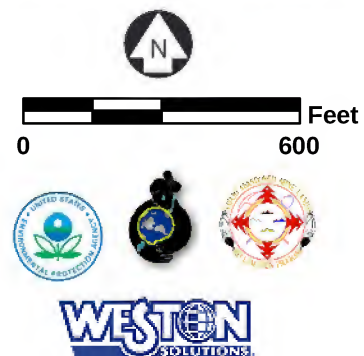
**Legend**

**Gamma Radiation Measurements**

- 0 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 - 50,000
- 50,000 - 100,000
- > 100,000

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Observed Waste Pile
- ▤ Observed Reclamation Cap
- ▧ Inaccessible due to steep grades
- 🏠 Observed Housing Structure
- ➡ Observed Adit

Gamma survey conducted 06/2010  
 Measured as counts per minute (cpm)  
 Average background 14,348 cpm





**Figure A-3 - Gamma Radiation Measurements, Above Two Times Background  
Mesa I 3/4 Incline Mine (95)  
Cove Chapter, Navajo Nation**



### Legend

#### Gamma Radiation Measurements

- < 2X Background
- > 2X Background

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades



Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

Average background = 10,322 cpm



**WESTON**  
SOLUTIONS



**Figure A-4 - Gamma Radiation Measurements  
Mesa I 3/4 Incline Mine (95)  
Cove Chapter, Navajo Nation**



**Legend**

**Gamma Radiation Measurements**

- 0 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 - 50,000
- 50,000 - 100,000
- > 100,000

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades

Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

Average background 10,322 cpm



**Figure A-5 - Sites Inaccessible**  
**Mesa I 1/2, West Mine (288), Mesa I 1/2 Mine (419)**  
**Cove Chapter, Navajo Nation**



**Legend**

**Gamma Radiation Measurements**

- 0 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 - 50,000
- 50,000 - 100,000
- > 100,000



**Mine Claim Boundaries**





**Figure A-6 - Gamma Radiation Measurements, Above Two Times Background  
Mesa I 1/4 Mine (423)  
Cove Chapter, Navajo Nation**



Mesa I 1/4 Mine (423)

## Legend

### Gamma Radiation Measurements

- < 2X Background
- > 2X Background

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades

Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

Average background = 11,377 cpm

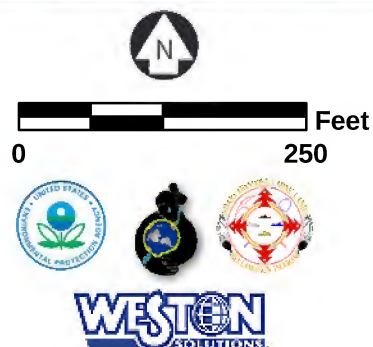




Figure A-7 - Gamma Radiation Measurements  
Mesa I 1/4 Mine (423)  
Cove Chapter, Navajo Nation



**Legend**

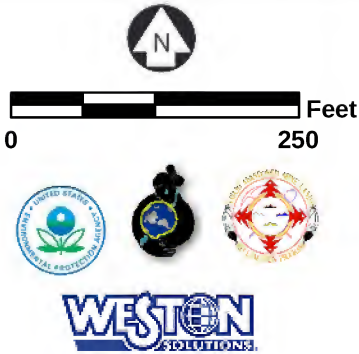
**Gamma Radiation Measurements**

- 0 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 - 50,000
- 50,000 - 100,000
- > 100,000

- General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades

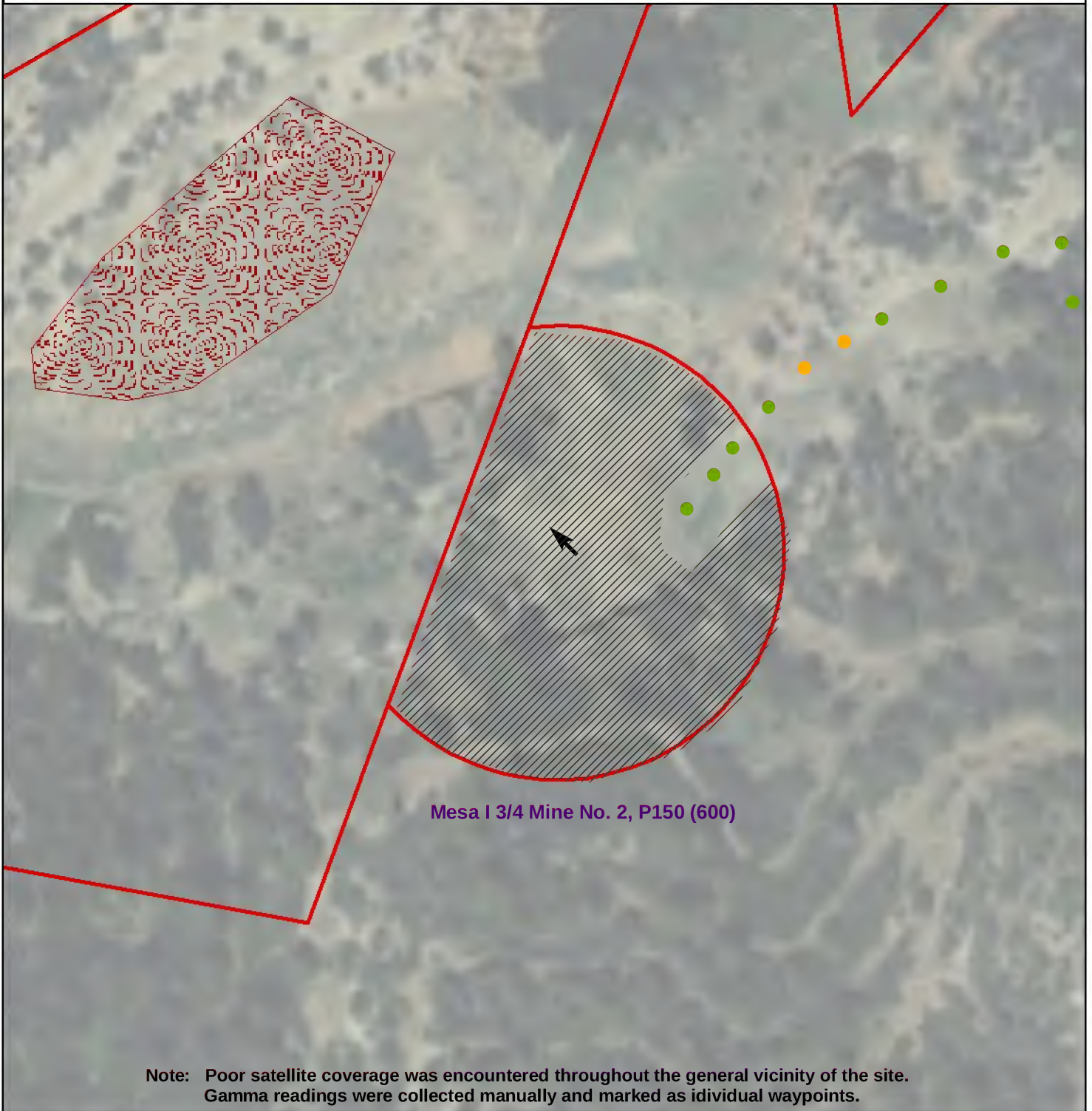
Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

Average background 11,377 cpm





**Figure A-8 - Gamma Radiation Measurements, Above Two Times Background  
Mesa I 3/4 Mine No. 2, P150 (600)  
Cove Chapter, Navajo Nation**



### Legend

#### Gamma Radiation Measurements

- < 2X Background
- > 2X Background

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades

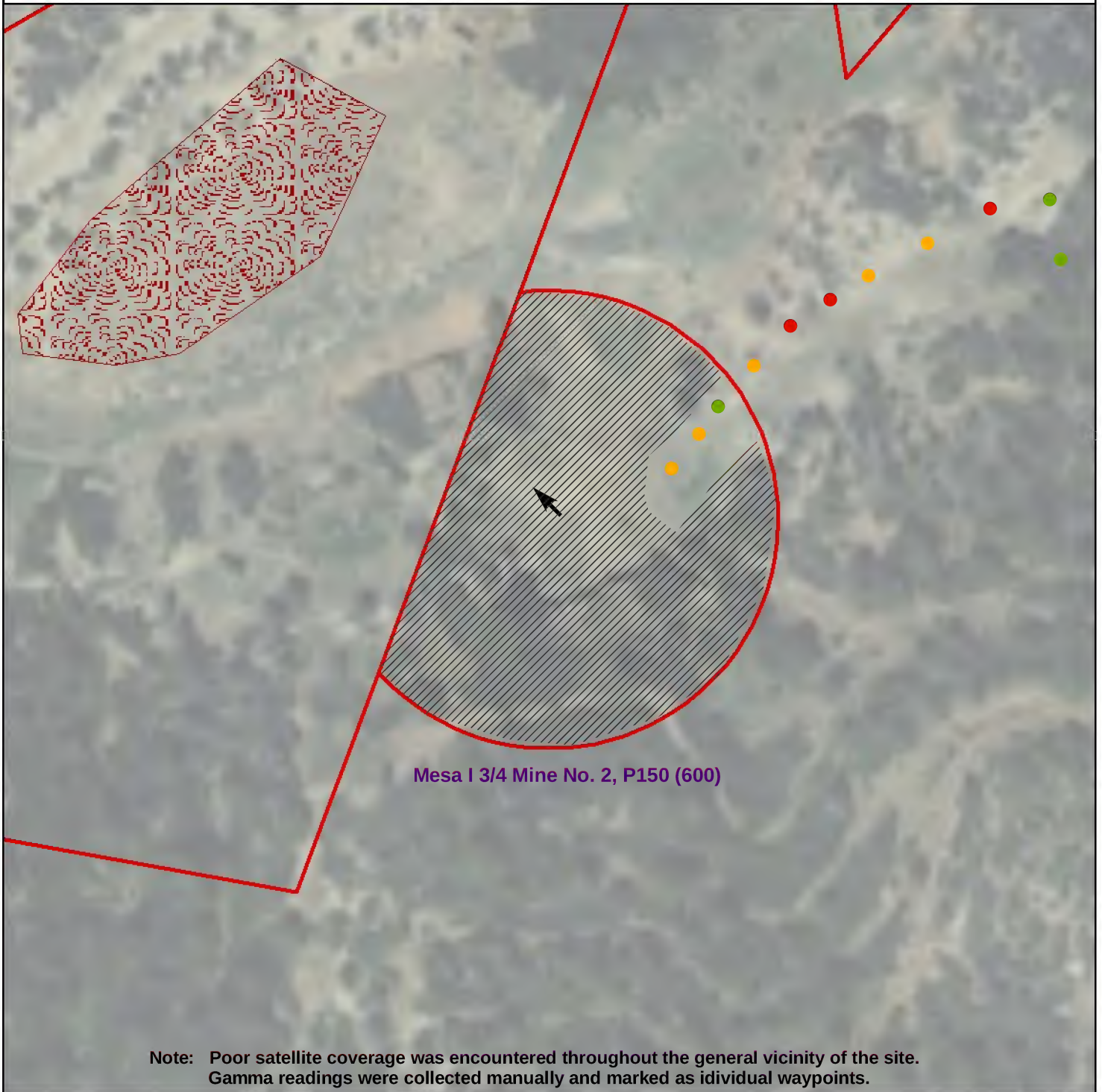
Gamma survey conducted 06/2010  
Measured as counts per minute (cpm)

Average background = 13,989 cpm





**Figure A-9 - Gamma Radiation Measurements**  
**Mesa I 3/4 Mine No. 2, P150 (600)**  
**Cove Chapter, Navajo Nation**



**Legend**

**Gamma Radiation Measurements**

- 0 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 - 50,000
- 50,000 - 100,000
- > 100,000

- ➔ General Direction Down-Slope
- ▭ Mine Claim Boundaries
- ▨ Inaccessible due to steep grades
- ▤ Observed Waste Pile

Gamma survey conducted 06/2010  
 Measured as counts per minute (cpm)

Average background 13,989 cpm

